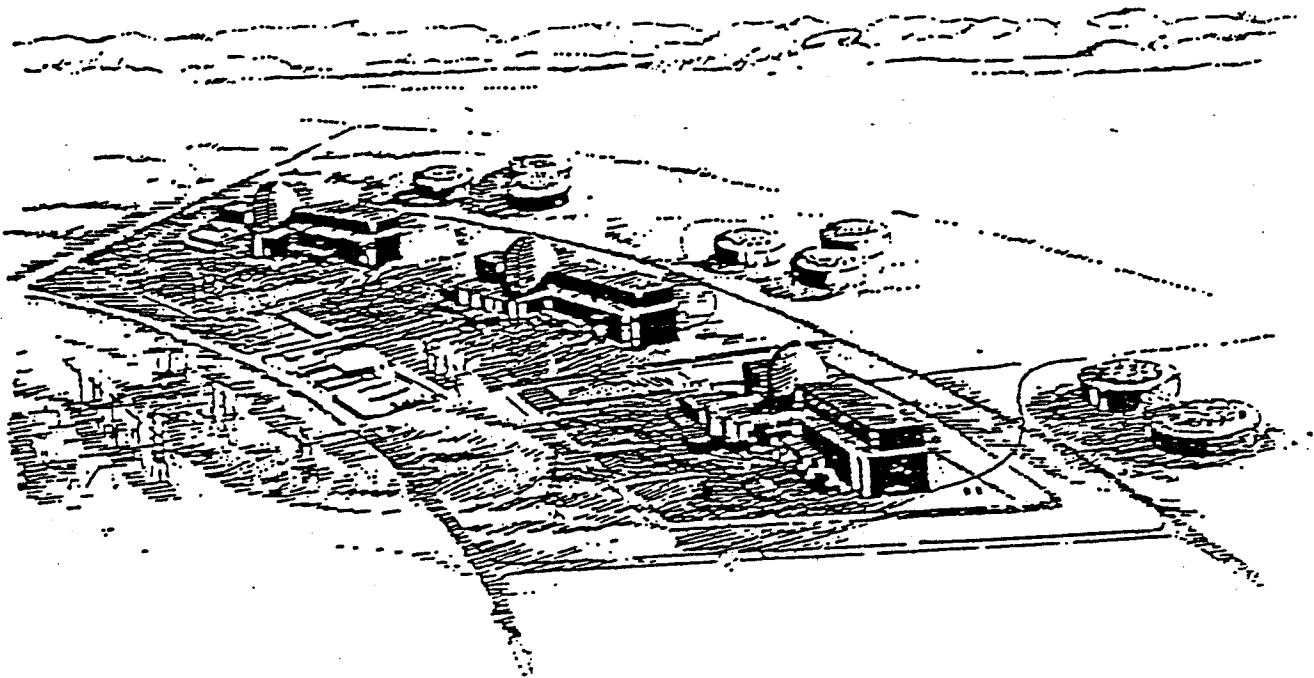


**DUST CONCENTRATION  
EVALUATION  
FOR  
PALO VERDE NUCLEAR GENERATING STATION  
UNITS 1, 2 & 3**



APRIL 1990

**BECHTEL POWER CORPORATION**






DOCUMENT TITLE SHEET

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Arizona Nuclear Power Project

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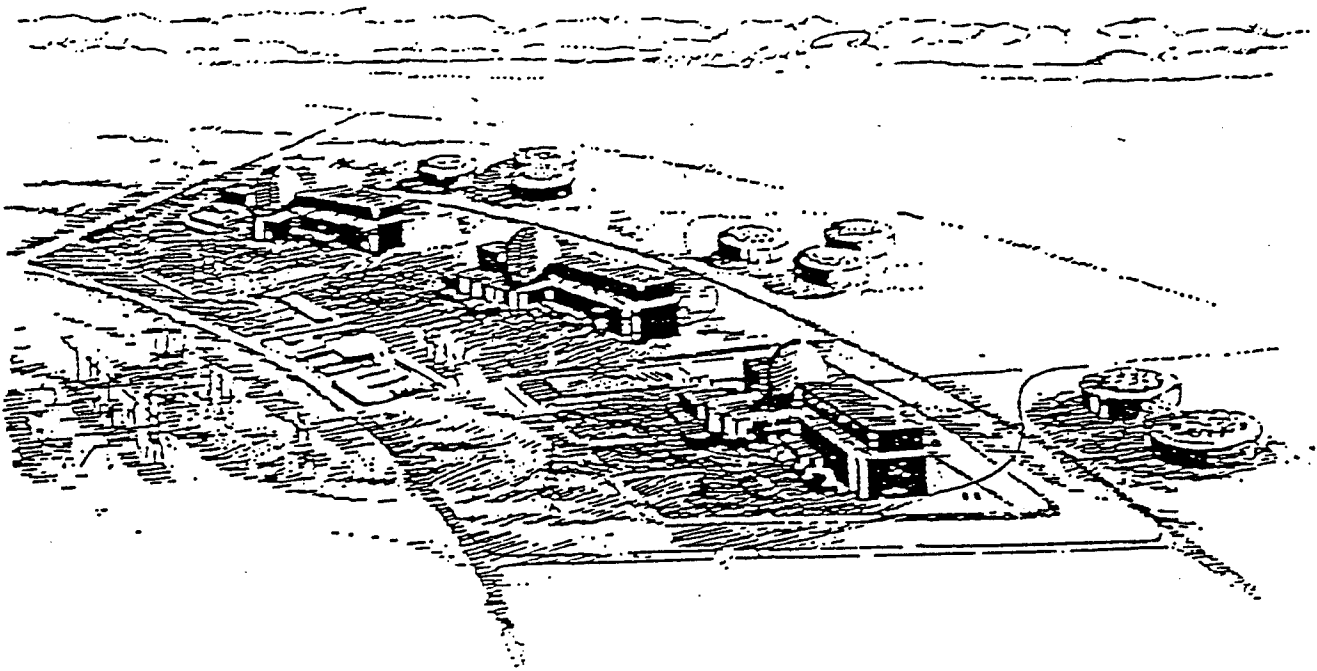
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COPY # 1

DUST CONCENTRATION  
EVALUATION  
FOR  
PALO VERDE NUCLEAR GENERATING STATION  
UNITS 1, 2 & 3



APRIL 1990

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## DUST CONCENTRATION EVALUATION SUMMARY

Blowing dust and dust storm conditions are characterized by abnormally large airborne particulate concentrations and greatly reduced visibility conditions. This study provides an estimate of the maximum historical particulate concentrations that may have occurred at the Palo Verde Nuclear Generating Station (PVNGS) site by using particulate/visibility relationships and 41 years (1949-1989) of National Weather Service (NWS) records of visibility observations during dust storms and blowing dust events in Phoenix, Arizona. The particulate concentrations were subsequently converted into particulate loadings by considering the durations of individual events. Specific dust storm events or parameters identified in this study include:

- Maximum single event particulate loading
- Maximum 24-hour particulate loading
- Maximum 30-day particulate loading
- Average dust storm particulate loading
- Annual frequency of dust storm occurrence
- Average duration of dust storms

Although the existing published literature contains limited information on dust storms, three studies were found which correlate visibility to particulate concentration. These studies consist of: (1) an extensive evaluation by Chepil and Woodruff published in 1957 based on data gathered in Kansas and Colorado in 1954 and 1955, (2) an evaluation by Patterson and Gillette published in 1977 based on data gathered in West Texas in 1973 and 1974, and (3) an evaluation by Hagen and Woodruff published in 1973 which compared a theoretical equation with the Chepil and Woodruff equation. Equations derived in each of these studies were applied to the 41 years of NWS visibility data recorded for Phoenix to obtain predicted dust concentrations.

Based on the conservative nature of the Chepil and Woodruff equation and its previous use in licensing submittals by the Washington Public Power Supply System, the resultant concentrations from utilizing the Chepil and Woodruff equation are deemed appropriate for use as design basis concentrations at the PVNGS site. Based on this equation, the following worst case dust storm/event parameters for the PVNGS site were identified:

- Highest particulate loading event was  $605 \text{ mg-hr/m}^3$  with a duration of 1.62 hours.
- Highest 24-hour total particulate loading was  $607 \text{ mg-hr/m}^3$ , which is equivalent to a 24-hour average concentration of  $25.3 \text{ mg/m}^3$ .
- Highest 30-day total particulate loading was  $1282 \text{ mg-hr/m}^3$ , which corresponds to a 30-day average concentration of  $1.78 \text{ mg/m}^3$ .
- Average total particulate loading for a dust storm event was  $78.4 \text{ mg-hr/m}^3$ .
- Maximum annual frequency was 9 dust storm events per year for the 41 year period data record.

- An average of 14.7 blowing dust events a year.
- An average of 4.0 dust storm events a year.
- Average duration of dust storm events was 0.89 hours.

The Chepil and Woodruff equation was based on a 6-foot elevation, indicating that these results apply for an elevation of 6 feet above ground level. It is believed that particulate concentrations during blowing dust and dust storm events decrease with increasing elevation. Based on the limited published literature a conservative reduction of approximately 40% may be realized for elevations of 35 feet above ground level or greater.

In addition, this evaluation concludes that Phoenix NWS data is the most representative data available for the PVNGS Site and that use of the average particulate concentration corresponding to the worst case 30-day dust data is an appropriate for determining design basis dust loadings.

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## **DUST CONCENTRATION EVALUATION**

### **1.0 PURPOSE**

The purpose of this study is to provide particulate concentration and loading data and regulatory methodology information which may be utilized to define design bases dust loadings for the Palo Verde Nuclear Generating Station (PVNGS) site. This study is intended to supersede that of "Particulate Characteristics of Dust Storms at the Palo Verde Nuclear Generating Station" dated October, 1978 (Reference 1).

## 2.0 SCOPE

The scope of this study includes the evaluation of available literature and data to determine worst case airborne particulate conditions and related particulate loadings that could occur at the PVNGS site. For rural areas in the Southwest, such conditions are associated with blowing dust and dust storm conditions. Tasks necessary to accomplish this scope of work are:

1. Review of the available literature to identify available data on blowing dust and dust storm conditions,
2. Review of existing blowing dust and dust storm data applicable to the PVNGS site; and
3. Development and execution of a technical evaluation to quantify potential worst case airborne particulate conditions and related particulate loadings at the PVNGS site.

In addition a review of regulatory information is included in the scope of work to determine the appropriate combination of meteorological events (dust storms and blowing dust events) which should be considered as the design basis for the PVNGS site.

Applied Environmental Consultants, Incorporated, (AEC), provided consulting services for this study. Appendix B to this Study is a letter of their concurrence with the evaluation information and certification of their technical input.

### 3.0 BACKGROUND

Blowing dust conditions are characterized by elevated airborne particulate concentrations and reduced visibility. The National Weather Service (NWS) defines a blowing dust event as an airborne dust induced reduction in visibility to less than 7 miles (11.3 km) but greater than 0.62 miles (1.0 km) (Reference 2). If visibility is reduced to 0.62 miles (1.0 km) or less at any point during the blowing dust event, the entire event is termed a dust storm.

For purposes of this study particulate concentration refers to the mass per unit volume of airborne particles ( $\text{mg}/\text{m}^3$ ) ( $\mu\text{g}/\text{m}^3$ ), while particulate loading refers to the concentration times a duration ( $\text{mg}\cdot\text{hr}/\text{m}^3$ ). The actual "loading" for a component (i.e., the total particulate encountered by the component) is determined by multiplying the particulate loading by a flow rate.

#### 3.1 Parameters Affecting the Generation of Airborne Dust

The parameters which affect the generation of airborne dust include:

- wind speed
- soil type
- soil moisture
- land use
- vegetation/ground cover

Wind speed represents the primary mechanism for raising and transporting erodible sized particles into the atmosphere. Soil type determines the fraction of the soil in a given size range which is susceptible to wind erosion. Soil moisture retards wind erosion by agglomerating small erodible particles into larger, non-erodible particles. Land use increases or decreases the number of erodible particles by affecting the formation of non-erodible crusted surfaces and disturbed erodible surfaces. Vegetation/ground cover retards the generation of airborne dust by reducing wind velocities, retaining moisture in the soil and bonding small erodible particles.

#### 3.2 Literature Review

Although blowing dust and dust storms are dramatic events with very high particulate concentrations, published literature contains limited information on the actual particulate characteristics during such events. NWS stations have extensive data on visibility during blowing dust and dust storm conditions which are used as an indication of the severity of the events, but have no concurrent particulate concentration or particulate loading data. The available literature is limited to a few studies on dust storm particulate concentrations, loadings and size distributions, and several additional studies relating visibility to particulate concentration. These data are summarized below:

A. Particulate Characteristics of Dust Storms at the Palo Verde Nuclear Generating Station (APS, October 1978)

This report (Reference 1) summarizes a sampling program conducted from June 9 through September 8, 1978 at the PVNGS site which was designed to

characterize the total particulate concentration and particulate size distribution at three heights above the ground (10, 40 and 75 feet) during dust storm events. The data collected did not include concurrent visibility measurements.

Three dust storms were recorded during the sampling program. The worst dust storm as recorded at a 10-foot elevation (August 6) had a duration of 0.95 hours, a particulate concentration of  $130.9 \text{ mg/m}^3$  and a particulate loading of  $124.4 \text{ mg-hr/m}^3$ . The average duration of the three dust storms was 1.17 hours. Time periods which did not exhibit blowing dust or dust storm conditions had a geometric mean dust concentration of  $61.3 \text{ } \mu\text{g/m}^3$ .

B. Sedimentary Characteristics of Dust Storms: Visibility and Dust Concentration  
(Chepil and Woodruff, February 1957)

This study (Reference 3) represents the most extensive study of concurrent visibility measurements and particulate concentrations. Particulate concentrations were measured at heights of 4, 6 and 8 feet in 1954 and at heights of 2, 5, 11 and 20 feet in 1955. A total of twenty-four measurements were collected in Kansas and Colorado. The measured particulate concentrations ranged from 3.18 to  $1327 \text{ mg/m}^3$  while the recorded visibility varied from 0.08 to 7.93 km.

The best fit relationship between visibility and particulate concentration was determined to be:

$$C_6 = 56/V^{1.25} \quad (\text{Eq. 3.1})$$

Where:  $C_6$  = Concentration of particulates at a 6-foot height  
( $\text{mg/m}^3$ ), and  
 $V$  = Visibility (km).

The same study also reported the change in particulate concentration with height as:

$$C_h = 437.9/h^{0.28} \quad (\text{Eq. 3.2})$$

Where:  $C_h$  = Concentration of particulates ( $\text{mg/m}^3$ ) at height h,  
and  
h = Height above ground (ft).

C. Measurements of Visibility vs. Mass-Concentration for Airborne Soil Particles  
(Patterson and Gillette, 1977)

Concurrent visibility and particulate concentrations were measured at a height of 6.6 feet during the Spring of 1973 and 1974 in rural areas of West Texas during blowing dust conditions for this study (Reference 4). A concentration/visibility relationship was determined from the 13 data points as:

$$C_{6.6} = 20/V^{1.07} \quad (\text{Eq. 3.3})$$

Where:  $C_{6.6}$  = Concentration of particulates at a 6.6-foot height ( $\text{mg}/\text{m}^3$ ), and

$V$  = Visibility (km).

The measured particulate concentrations varied from 2.0 to 440  $\text{mg}/\text{m}^3$  and recorded visibilities from 0.06 to 8.0 km.

D. The Influence of Soil Insertion on Atmospheric Size Distributions (Sehmel, 1976)

The objectives of this study (Reference 5) were to determine airborne soil concentrations and possible particulate modes in a region of low anthropogenic air pollution (Hanford, Washington). A particulate mode can be defined as a predominant concentration of a given size range of particles between valleys of lower concentrations for larger and smaller size ranges. Measurements of particle volume distributions (total volume of particulates contained in a given size range) were made at a height of 0.9 m (3 ft.) above the ground for both dust storm and non-dust storm conditions. An upper limit of particulate concentration was then determined by integrating the "upper limit" particle volume distribution and assuming a particle density. The assumed particle density of 2.0  $\text{g}/\text{cm}^3$  yielded an upper limit particulate concentration of 233  $\text{mg}/\text{m}^3$ .

E. Washington Public Power Supply System Unit 2 Final Safety Analysis Report (1989)

This document (Reference 6) reports approximate values of dust concentrations using the empirical relationship developed by Chepil and Woodruff (Equation 3.1) from visibility measurements at the Hanford Meteorological Station from 1953-1970. Reports of zero visibility (0-0.10 km) were set equal to 0.10 km for purposes of calculating particulate mass concentrations. The two highest estimated particulate loadings were 160 and 100  $\text{mg}\cdot\text{hr}/\text{m}^3$  and the corresponding dust storm durations were 18 and 1.0 hours, respectively.

In addition, this document provides a compilation of particulate concentration as a function of height for two dust storms in the Hanford, Washington area. This data is repeated in Table 3-1 for reference purposes.

Table 3-1  
 AIRBORNE CONCENTRATIONS FOR PARTICULATES GREATER THAN  $0.9 \mu\text{m}$  FOR  
 TWO DUST STORMS IN THE HANFORD, WASHINGTON AREA\*

April 1972		August 11, 1955	
Height (ft)	Particulate Conc. ( $\text{mg}/\text{m}^3$ )	Height (ft)	Particulate Conc. ( $\text{mg}/\text{m}^3$ )
1.0	235.0	1.2	22.0
3.0	11.4	6.6	14.5
6.6	6.0	49.9	3.7
9.8	3.1	100.0	1.7
32.8	1.13		
105.0	0.41		

\*Data duplicated from Reference 6.

- F. Effects of Air Pollution on Visibility (Elmer Robinson, edited by A.C. Stern, 1968). Air Pollution from Dust Storms in the Great Plains (L.J. Hagen and N.P. Woodruff, 1973)

Hagen and Woodruff (Reference 7) used formulations from Robinson (Reference 8) to develop the following theoretical visibility/concentration relationship:

$$C = 57.2/V \quad (\text{Eq. 3.4})$$

This expression assumes that the visibility reduction is attributable to scattering by uniform particles  $22 \mu\text{m}$  in diameter, and that the scattering of light by small particles and absorption by particles and gases provide negligible contributions to visibility reduction. The particle density is assumed to be  $2.0 \text{ gm}/\text{cm}^3$ . Equation 3.4 predicts greater particulate concentrations than Equations 3.1 and 3.3 for visibilities greater than approximately 1 km, and lower particulate concentrations for visibilities less than approximately 1 km (i.e., dust storms).

### 3.3 Licensing Documentation Review

Review of Nuclear Regulatory Commission licensing documentation identified two documents which provide the primary guidance on climatology related design recommendations.

- A. Standard Review Plan (SRP) Section 2.3.1, Regional Climatology, states that the meteorological conditions to be used as design and operating bases for nuclear power plants should include consideration of the probable maximum annual frequency of occurrence and time duration of dust (sand) storms, (Reference 9). In addition, the SRP states that data on severe weather phenomena can be based on standard meteorological records from nearby representative NWS stations, as long as the applicability of this data to represent site conditions during the expected period of reactor operation can be substantiated.
- B. U.S. Nuclear Regulatory Commission Regulatory Guide 1.27, Ultimate Heat Sink for Nuclear Power Plants (Reference 10), describes a basis that is acceptable to the NRC staff that may be used to implement 10CFR50 Appendix A General Design Criteria 2, Design Bases for Protection Against Natural Phenomena for Ultimate Heat Sinks. This Regulatory Guide indicates that the ultimate heat sink capacity should be sufficient to provide cooling (its primary safety function) for both the period of time needed to evaluate the situation and the period of time needed to take corrective action. It further indicates that a period of 30 days is considered adequate, after which procedures should be available to ensure continued capability.

With respect to meteorological conditions, the Regulatory Guide indicates that the conditions considered should be selected with respect to the controlling parameters and critical time periods unique to the specific design. For example, a cooling pond may have a controlling parameter of outside temperature and its unique design could result in a maximum pond temperature 5 days following a shutdown. The Regulatory Guide would then imply that the evaluation of the pond's capability to meet GDC 2 should consider the maximum outside temperature occurring 5 days after shutdown. If there is more than one critical time period, the periods need not occur contiguously. The Regulatory Guide does allow the licensee to combine the critical time periods (including the 30 days) to create a synthetic period of time to use as a design basis or utilize actual worst consecutive day historical climatological data as the design bases. It further defines that the appropriate regional climatological information pertains to a recent period of record at least 30 years in length.

PVNGS's current design is based on (Reference 1 and 11):

- Dust storms with an average duration of 48 minutes and a maximum duration of 4 hours
- Worst case 30 day dust concentration consisting of 131 mg/m<sup>3</sup> for 5 hours and 61.3 µg/m<sup>3</sup> for the remainder of 30 days (Note: This corresponds to a total 30-day particulate loading of 699 mg-hr/m<sup>3</sup>)



## 4.0 METHODOLOGY

The available literature and data bases indicate limited measurements of particulate concentrations during dust storms and blowing dust conditions and no measurements of long term (30 day) particulate loadings. Since measurement data are very limited, the best available method for determining worst case particulate loadings for various averaging periods is to use existing long term NWS visibility observations during blowing dust and dust storm conditions and translate the visibility observations into dust loadings utilizing the particulate concentration/visibility relationships established through a search of the existing literature.

Areas in the vicinity of the PVNGS site with visibility observations during blowing dust and dust storm events include Phoenix Sky Harbor Airport (Phx); Yuma, Arizona; Needles (Ndl), California; Blythe (Bl), California; Tucson (Tuc), Arizona; and Gila Bend (GB), Arizona. The location of these areas relative to each other are shown in Figure 4-1. Phoenix, Gila Bend and the PVNGS site are in close proximity to each other, and are also characterized by similar blowing dust episodes which have been shown in NUREG/CR-3211, "A Dust Climatology of the Western United States" (Reference 12) to generally occur during the summer season. NWS observations at Phoenix are much longer (1949-1989) than Gila Bend (1944-1962), and as discussed in Section 4.2 represent the most continuous and comprehensive database available for analysis. Maximum particulate concentrations and loadings were thus calculated using the 41 year NWS record of visibility conditions in Phoenix, and each of the visibility/concentration relationships identified through the literature search (Eqs. 3.1, 3.3, and 3.4).

This section describes the existing NWS data base, the applicability of the NWS data base to the PVNGS site, the calculation procedures used to calculate particulate concentrations and the resulting particulate loadings and the applicability of utilizing the worst case 30-day meteorological conditions as a design bases.

### 4.1 Data Base Description

The NWS data base consists of visibility observations made during blowing dust and dust storm events at Phoenix Sky Harbor Airport from 1949 to 1989 (41 years). This data base is maintained on microfiche and original NWS written records. Visibility observations prior to 1949 for the Phoenix area were not made by the NWS. Observations of visibility reduction due to blowing dust may be recorded whenever visibility is reduced to less than 7 miles and are always recorded when it is reduced to 3 miles or less (Reference 2). These observations are made at varying intervals during blowing dust and dust storm conditions depending upon the variability of visibility and the observer. Some observations may be only one to two minutes apart while others may be up to one hour apart. Once visibility has been reduced to 3 miles or less, observations are recorded until the visibility returns to greater than 7 miles. A complete listing of the Phoenix Sky Harbor data base is presented in Appendix A.

With respect to the analysis presented in this study a blowing dust or dust storm event is assumed to be occurring between an initial visibility observation of 7 miles or less and a final observation of 7 miles or greater. Since a blowing dust or dust storm event commences and reduces visibility quickly, the first visibility observation of less than 7 miles

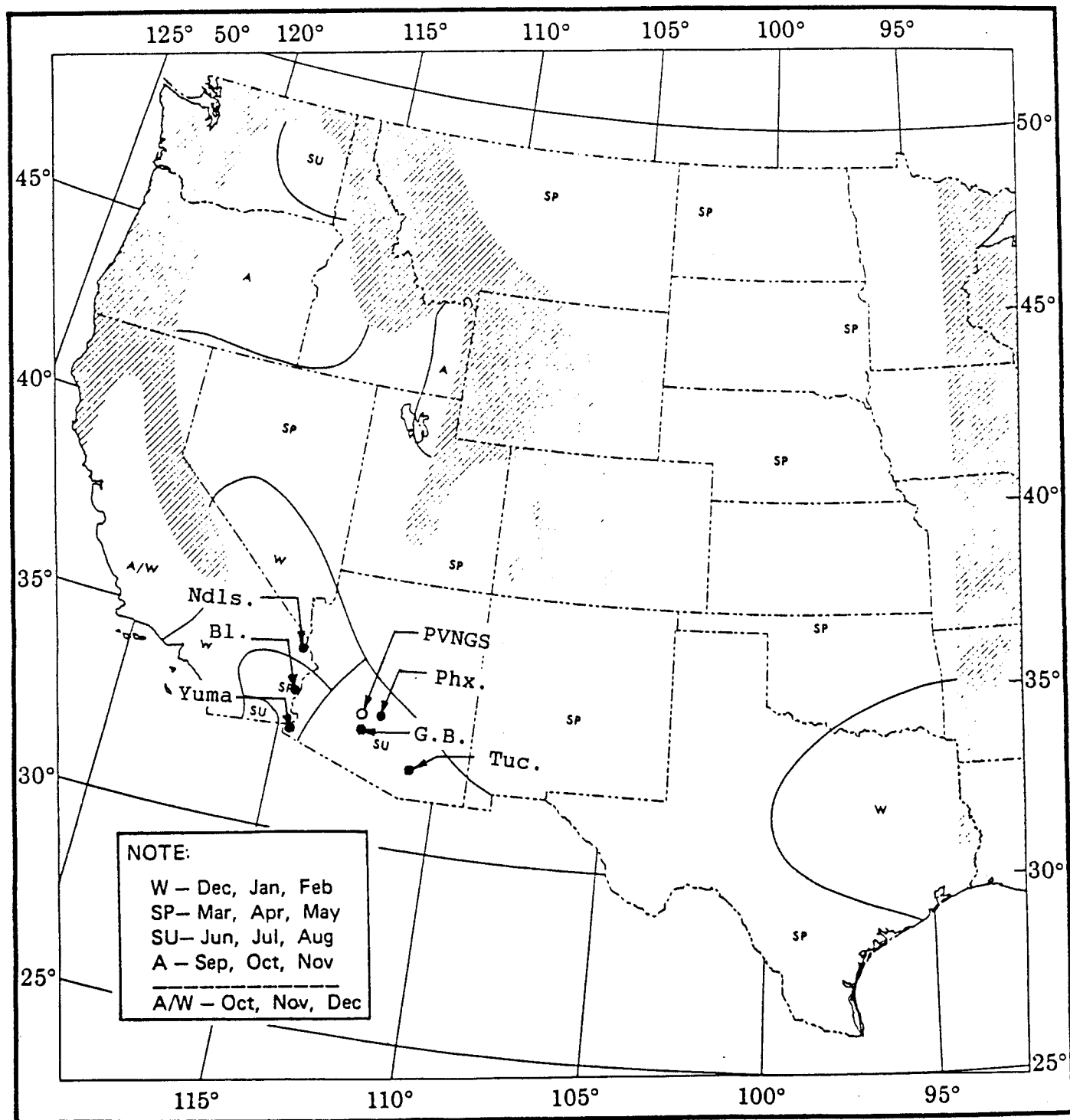


Figure 4-1 PRIMARY SEASON OF DUST EPISODES WITH VISIBILITY LESS THAN 5/8 MILE (REPRODUCED FROM REFERENCE 12).

is assumed to signal the start time of the event. The blowing dust/dust storm event is considered complete when a visibility value of 7 miles or greater is first recorded. The end time of an event is linearly interpolated to 7 miles from the first visibility observation of greater than 7 miles and the previous observation (of less than 7 miles). As described in Section 3.0, if at any time during an event the visibility is reduced to 1.0 km or less, the entire event is termed a dust storm.

#### 4.2 Applicability of Phoenix Visibility Observations to the PVNGS Site

Most dust storms in Phoenix and the PVNGS site are either thunderstorm related or caused by intense winds which accompany strong frontal systems passing over the region. Frontal induced dust storms are regional in nature and affect large areas simultaneously. Such storms should occur at approximately the same time and for the same duration in both Phoenix and the PVNGS site, providing soil conditions have the same susceptibility to wind erosion at both locations. The following paragraphs discuss these issues in greater detail.

Thunderstorm-related dust storms represent the predominant dust storms for both Phoenix and the PVNGS site, particularly in the summer season. All three dust storms observed during the APS study (Reference 1) were thunderstorm-related. These thunderstorms originate in southeastern Arizona and travel in a western and northwestern direction. The graphs presented in NUREG/CR-3211 (Reference 12) indicate that Phoenix, being closer to the center of thunderstorm activity than the PVNGS site, may have a higher frequency of occurrence of dust storms than the PVNGS site.

Comparison of the mean annual characteristics of thunderstorm-related dust storms for Phoenix and Gila Bend (Table 4-1) indicates a higher frequency of occurrence for Phoenix but almost identical annual durations of reduced visibility. The PVNGS site being situated in the same locale should exhibit similar characteristics. The relative location of Phoenix and the PVNGS site relative to isopleths of constant annual hours of reduced visibility are shown in Figure 4-2. Both locations appear to be located in areas with similar annual durations of reduced dust-related visibilities.

With respect to soil conditions at Phoenix and the PVNGS site, Table 4-2 presents a comparison of local land surface characteristics. This table was constructed from an EPA report on  $PM_{10}$  (Particulate Matter less than 10 microns in aerodynamic diameter) emissions for the area (Reference 13) and wind tunnel studies conducted in 1986 to evaluate the production of aerosols for Arizona-type surfaces (Reference 14). Key characteristics of a site which affect the potential for blowing dust are: (1) threshold shear velocities required to entrain dust, (2) ground roughness effects on turbulence, and (3) percent silt and clay fraction of the soils in the region. Table 4-2 would indicate that the Phoenix airport vicinity exhibits lower wind thresholds and overall higher percent silt and clay make up than the PVNGS site. This would indicate that the Phoenix area requires a lower wind velocity to entrain dust than at the PVNGS site. Urbanization of the Phoenix Metropolitan area could potentially lessen the frequency of occurrence of blowing dust and dust storm conditions during the late 1970's and 1980's, as urbanization tends to decrease the areas capable of contributing to airborne dust. However, even with the gradual urbanization of the Phoenix area, the NWS data record is sufficiently long that conservative representative values can be calculated.

TABLE 4-1  
COMPARISON OF THE ANNUAL DUST INTENSITY AND  
FREQUENCY OF DUST STORMS ASSOCIATED WITH  
THUNDERSTORMS FOR OBSERVATION STATIONS  
NEAR THE PVNGS SITE\*

Observation Station	Annual Number of Hours with Visibilities (miles) of:				Annual Number of Episodes with Visibilities (miles) of:	
	<7	<3	<1	<5/8	<7	<5/8
Areas Characterized By Summer Thunderstorms Related Dust Storms						
Gila Bend	24.3	5.6	1.6	1.4	10.8	2.1
Phoenix	21.4	5.8	1.7	1.4	18.1	1.6
Tucson	3.9	1.2	0.3	0.2	3.8	0.3
Areas Characterized By Spring Thunder- storm Related Dust Storms						
Blythe	31.5	9.8	4.0	3.8	12.7	3.0
Needles	5.7	1.2	0.3	0.3	2.8	0.2
Yuma	63.1	24.1	5.1	3.8	23.9	4.7

\* Developed from Reference 12.

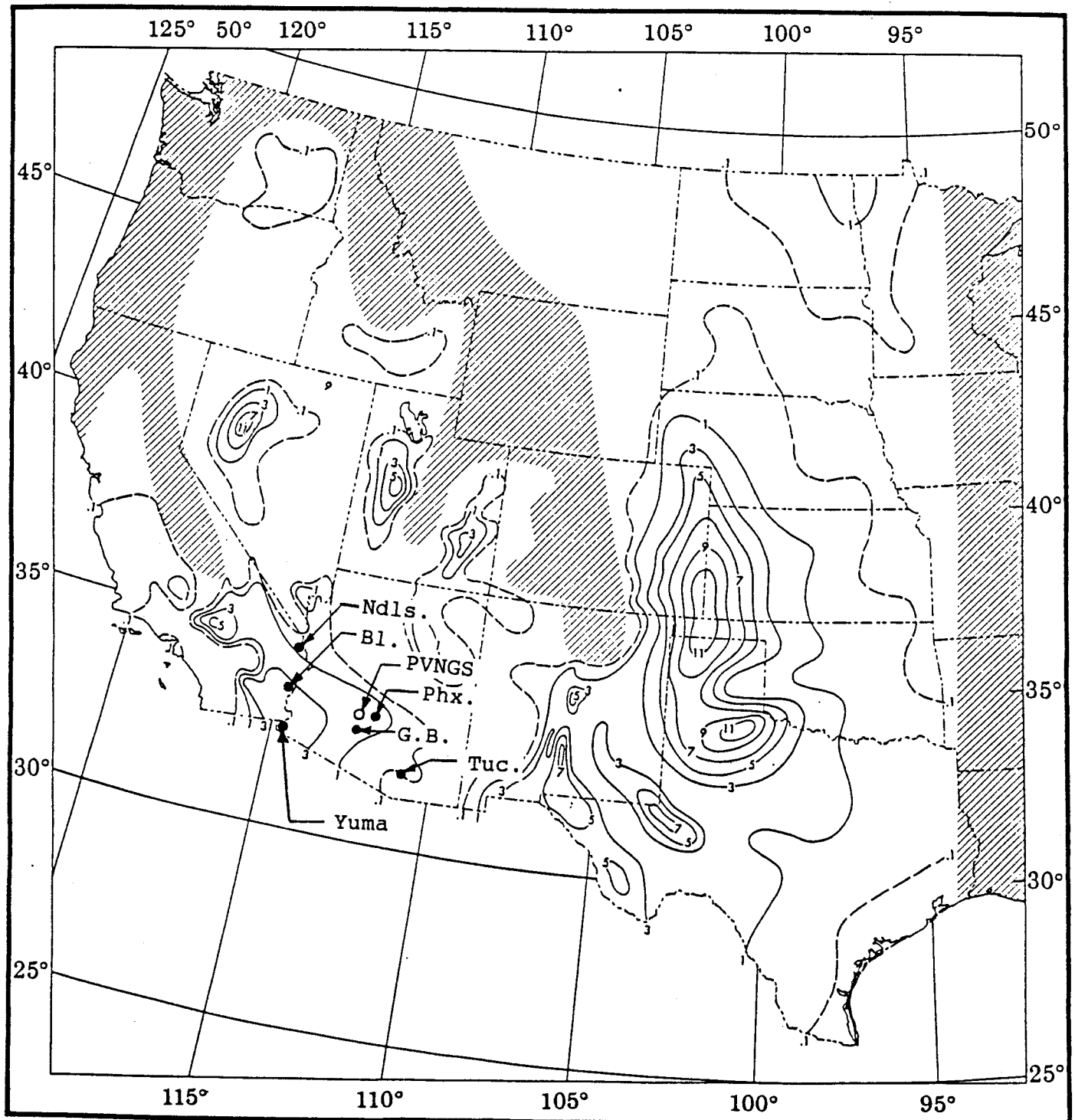


Figure 4-2 ANNUAL AVERAGE NUMBER OF HOURS OF DUST EPISODE  
VISIBILITY LESS THAN 5/8 MILE  
(REPRODUCED FROM REFERENCE 12).

Table 4-2  
COMPARISON OF LOCAL LAND SURFACE CHARACTERISTICS  
FOR PHOENIX AND THE PVNGS SITE\*

	Threshold Wind 10 m Equivalent (m/sec)	Roughness (cm)	Percent Clay/Silt
Phoenix:			
River Channel	6.7	0.01	27.7
Disturbed Desert	8.1	0.07	3.2
Construction	14.7	0.03	24.7
Palo Verde (est.):			
Agriculture	15.6	0.03	18.6
Natural Desert	11.3	0.02	17.2

\* Developed from References 13 and 14.

As discussed in Section 4.0, Phoenix, Sky Harbor data represents the closest, longest, and most continuous data available. Based on the above discussions, the NWS observations for the Phoenix Airport are considered appropriate for the PVNGS site design.

### 4.3 Calculation Methodology to Determine Particulate Loadings

The particulate concentrations during blowing dust and dust storm conditions are calculated using each of the three equations relating particulate concentrations to visibility identified through the literature search (Equations 3.1, 3.3, and 3.4).

In this evaluation, concentrations for reported zero visibility conditions are calculated by assuming a visibility of 0.10 km (Note: zero visibility represents an actual visibility between 1/16 mile and zero). This is necessary since visibility appears in the denominator of all three equations, i.e., an entry of zero visibility results in an infinite particulate concentration which is not realistic. This approach is consistent with other studies in which particulate loadings were estimated from visibility/concentration relationships (References 6 and 7) and is considered a best approximation. This is because visibility measurements are highly variable during such occasions, are not continuous, and are probably fluctuating above and below the 0.10 km value during the time interval.

For each of the visibility observations reported in Appendix A, a corresponding particulate concentration was calculated. Each of the visibility observations is conservative in that the observation corresponds to the furthest visible marker distance, whereas actual visibility is the distance between that marker and the next most distant marker (which is not visible). Particulate loadings for a given time interval between visibility observations were assumed to be the mean of the calculated concentration at the start of a given observation and the start of the next observation multiplied by that time interval. This assumption should result in higher than actual concentrations considering the conservative nature of the visibility observations described above. Assuming the higher concentration for the entire time interval would lead to a greater overestimate of the particulate loadings.

The total particulate loading of each blowing dust or dust storm event was calculated from the following expression:

$$\text{TDL} = \sum_{n=1}^N (C_i + C_f)_n t_n / 2 \quad (\text{Eq. 4.1})$$

Where:

TDL	=	Total particulate loading (mg-hr/m <sup>3</sup> )
n	=	n <sup>th</sup> visibility observation of the event
C <sub>i</sub>	=	Initial concentration of n <sup>th</sup> visibility observation (mg/m <sup>3</sup> )
C <sub>f</sub>	=	Final concentration of n <sup>th</sup> visibility observation (mg/m <sup>3</sup> )
t <sub>n</sub>	=	Elapsed time between initial and final visibility of the n <sup>th</sup> observation (hr)
N	=	Number of visibility observations during the event

In calculating the particulate loadings for 24 hours and 30 days, a conservative background concentration was necessary for non-blowing dust or dust storm time intervals. The background concentration was assumed to be the highest 30-day rolling average measured at the PVNGS site, excluding days with blowing dust conditions. This background particulate concentration was determined from historical measurements made at the PVNGS site during 1975-1976 and 1978 (References 1 and 15). For this analysis any day with an average particulate concentration of  $200 \mu\text{g}/\text{m}^3$  or greater was assumed to contain time periods with blowing dust. The highest 30-day rolling average background concentration measured at the PVNGS site was determined to be  $92 \mu\text{g}/\text{m}^3$  between September 21 and October 20, 1975.

The calculated 24-hour particulate loading is the loading of any event(s) in that 24 hour period, plus  $92 \mu\text{g}/\text{m}^3$  multiplied by 24 hours minus the duration of the event(s). In considering the 24 hour particulate loadings, the day is considered from midnight to midnight.

Thirty day rolling averages represent consecutive "30-day averages", where each 30-day period commences 24 hours after the start of the prior 30-day period. Thirty day rolling averages are calculated on a midnight to midnight basis. Non-overlapping 30-day averages require that the 30-day averages not contain a common time period.

The thirty day rolling total particulate loadings were calculated by summing the total particulate loadings of all events within the 30-day period and assuming the maximum background particulate concentration measured at the PVNGS site for non-blowing dust periods as follows:

$$\text{TDL}_{30} = \sum_{i=1}^N \text{TDL}_i + C_{\text{BG}} (720 - \sum_{i=1}^N T_i) \quad (\text{Eq. 4.2})$$

Where:

$\text{TDL}_{30}$	=	30-day rolling average total particulate loading ( $\text{mg}\cdot\text{hr}/\text{m}^3$ )
$\text{TDL}_i$	=	Total particulate loading of each blowing dust event within the 30-day period ( $\text{mg}\cdot\text{hr}/\text{m}^3$ )
$C_{\text{BG}}$	=	Maximum 30-day background particulate concentration measured at PVNGS ( $92 \mu\text{g}/\text{m}^3$ )
$T_i$	=	Time duration of each blowing dust or dust storm event (hr)
$N$	=	Number of blowing dust and dust storm events during the 30-day period.



#### **4.4 Variation of Particulate Concentration with Height**

Review of data in the published literature generally indicates that particulate concentrations decrease with increasing height above ground. Particulate concentration data versus height above ground for the Palo Verde site are evaluated in Section 5.5 of this study using Chepil and Woodruff, and Washington Public Power Supply System analyses (References 1, 3 and 6).

#### **4.5 Applicability of Regulatory Guide 1.27 Methodology**

The recommended methodology described in Regulatory Guide 1.27 for demonstrating compliance with 10CFR50 Appendix A General Design Criteria 2, for Ultimate Heat Sinks is applied in this study for assessing controlling meteorological parameters, critical time periods, length of data record available and meteorological effects for dust design basis loadings.

Dust loadings are typically used in specifying the quantities of dust that filters must retain while performing their safety function. As such, the safety function of the filters is to pass sufficient clean air to allow the HVAC systems to provide their required safety function. If a filter becomes overloaded with dust and cannot be replaced, the HVAC system may no longer be able to perform its safety function. Filter systems in response to an accident are passive components; therefore, the 30 days specified in Regulatory Guide 1.27 is appropriate for the time needed to evaluate the situation and take corrective action.

Controlling meteorological parameters associated with dust are time periods when elevated quantities of dust are in the air, i.e., blowing dust or dust storm events. Therefore, in considering design bases dust loadings, it would be appropriate to consider some initial loading and then confirm that the filter has the capability to retain an additional amount of dust equal to 30 days of dust loading (based on the average concentration for the worst 30-day period) or can be replaced during the 30-day interval as required, where the 30 days is based on a historical worst 30 consecutive day period.

In addition, considering that the estimated particulate loadings are based on information for a period of 41 years, the Regulatory Guide definition of 30 years of record for appropriate climatological information is satisfied.

## 5.0 RESULTS

This section summarizes the highest calculated particulate concentrations and total particulate loadings by applying the methodology discussed in Section 4 to the NWS observations (Appendix A to this study). Comparing the three equations (3.1, 3.3 and 3.4), for visibility less than 1 km, Equation 3.1 yields the highest concentrations, while Equation 3.4 yields higher concentrations beyond 1 km. Equation 3.3 yields the lowest concentrations. Equation 3.1 was utilized to predict dust loading for the Washington Public Power Supply System Plant Unit 2 (Reference 6), and as discussed in Section 3.2, is based on the most extensive study of particulate concentrations versus visibility. The time period in which the measurements were taken was that of the "dust bowl". According to Table 5-1 through Table 5-5, the maximum particulate concentrations and particulate loadings for the Phoenix visibility data were obtained using the Chepil and Woodruff equation (3.1). Although the ensuing tables summarize the results using equations 3.1, 3.3 and 3.4, the text is limited to a discussion of results determined from equation 3.1 as it provides the most conservative particulate concentrations and loadings and has precedence for use as a licensing basis.

### 5.1 Single Event Particulate Loadings

The calculated ten highest total particulate loadings produced by a single blowing dust or dust storm event are shown in Table 5-1. The highest particulate loading event occurred on August 25, 1963, lasted for 1.62 hours, and produced a maximum total particulate loading of 605 mg-hr/m<sup>3</sup>. Nine of the ten highest particulate loading events occurred during July and August. The August 4, 1957 event was the only blowing dust event among the ten highest particulate loading events; the other nine were dust storms.

### 5.2 Twenty-Four Hour Particulate Loadings

The highest 24-hour total particulate loadings and the corresponding 24-hour average concentrations are listed in Table 5-2. The highest 24-hour total particulate loading was 607 mg-hr/m<sup>3</sup> and occurred on August 25, 1963. As can be seen from Tables 5-1 and 5-2, the highest single particulate loading event of 1.62 hours in duration, plus the conservative background concentration of 92 µg/m<sup>3</sup> for 22.38 hours also produced the worst 24-hour particulate loading. This particulate loading is equivalent to an average concentration of 25.3 mg/m<sup>3</sup> for the 24-hour duration.

### 5.3 Thirty Day Total Particulate Loadings

The highest 30-day non-overlapping, rolling total particulate loadings and the corresponding 30-day average dust concentrations are shown in Table 5-3. The highest 30-day period on record occurred from July 22 to August 19, 1961. The maximum total particulate loading during this time period was 1282 mg-hr/m<sup>3</sup> and the 30-day average concentration was 1.78 mg/m<sup>3</sup>. This value corresponds to an appropriate value for design basis loadings. Table 5-4 lists information for the blowing dust events and dust storms contained in the worst case 30-day period. Figure 5-1 is a pictorial presentation of the worst case 30-day period showing the highest individual daily concentration (the time durations are not to scale). The highest 30-day total particulate loading contained

4 major events with total particulate loadings of greater than 100 mg-hr/m<sup>3</sup> (473 on July 22; 448 on July 28; 127 on August 18; and 121 on August 4). A fifth event was a minor dust storm which did not result in a significant particulate loading. It should be noted that the highest individual particulate loading event did not occur during the worst 30 day period.

Table 5-1  
HIGHEST SINGLE EVENT TOTAL PARTICULATE LOADINGS FOR 1949-1989  
USING EQUATIONS 3.1, 3.3 AND 3.4.

Date	Duration (hr)	Total Particulate Loading* (mg-hr/m <sup>3</sup> )		
		Eq. 3.1	Eq. 3.3	Eq. 3.4
1. 08/25/63	1.62	605	144	352
2. 07/22/61	1.38	473	116	287
3. 08/02/51	1.07	453	110	273
4. 08/04/57	0.90	449	106	260
5. 07/28/61	1.03	448	109	268
6. 08/03/68	0.48	423	100	243
7. 07/22/50	1.32	357	86.1	212
8. 05/20/54	0.87	343	88.0	222
9. 08/05/72	0.38	298	71.5	174
10. 08/14/51	0.40	291	68.7	167

\* Equations 3.1 and 3.3 are based on an elevation of approximately 6 feet.  
Equation 3.4 is based on a uniform particle diameter of 22 microns.

Table 5-2  
 HIGHEST 24-HOUR TOTAL PARTICULATE LOADINGS AND  
 AVERAGE PARTICULATE CONCENTRATIONS FOR 1949-1989  
 USING EQUATIONS 3.1, 3.3, AND 3.4

	Date	Total Particulate Loading* (mg-hr/m <sup>3</sup> )			Average Particulate Concentration* (mg/m <sup>3</sup> )		
		Eq. 3.1	Eq. 3.3	Eq. 3.4	Eq. 3.1	Eq. 3.3	Eq. 3.4
1.	08/25/63	607	146	354	25.3	6.08	14.8
2.	07/22/61	488	122	300	20.3	5.07	12.5
3.	08/02/51	461	115	283	19.2	4.80	11.8
4.	08/04/57	453	109	262	18.9	4.52	10.9
5.	07/28/61	450	111	270	18.8	4.62	11.3
6.	08/03/68	426	102	246	17.7	4.26	10.2
7.	07/22/50	360	88.2	214	15.0	3.68	8.93
8.	05/20/54	345	90.2	224	14.4	3.76	9.34
9.	08/14/51	332	82.2	200	13.8	3.43	8.34
10.	08/05/72	301	73.5	177	12.5	3.06	7.37

\* Equations 3.1 and 3.3 are based on an elevation of approximately 6 feet. Equation 3.4 is based on a uniform particle diameter of 22 microns.

TABLE 5-3

HIGHEST 30 CONSECUTIVE DAY TOTAL PARTICULATE LOADINGS  
AND AVERAGE PARTICULATE CONCENTRATIONS FOR  
1949-1989 USING EQUATIONS 3.1, 3.3 AND 3.4

	Period <sup>a</sup>	Year	Number of Dust Storms in Time Period	Minimum Time Between Storms (Days)	Total Particulate Loading <sup>b</sup> (mg-hr/m <sup>3</sup> )			Average Particulate Concentration <sup>b</sup> (mg/m <sup>3</sup> )		
					Eq. 3.1	Eq. 3.3	Eq. 3.4	Eq. 3.1	Eq. 3.3	Eq. 3.4
1.	07/22-08/19	1961	5	0	1282	378	863	1.78	0.53	1.20
2.	07/23-08/20	1951	6	0	1171	342	759	1.63	0.48	1.05
3.	07/06-08/04	1957	3	3	958	301	675	1.33	0.42	0.94
4.	07/27-08/25	1963	4	6	820	260	562	1.14	0.36	0.78
5.	07/03-07/29	1959	6	3	703	244	539	0.98	0.34	0.75
6.	07/16-08/14	1971	5	3	660	236	523	0.92	0.33	0.73
7.	07/18-08/11	1968	5	1	619	204	410	0.86	0.28	0.57
8.	07/16-08/12	1972	3	2	598	225	502	0.83	0.31	0.70
9.	07/01-07/22	1950	2	1	565	191	380	0.78	0.27	0.53
10.	07/09-08/06	1949	3	3	496	191	408	0.69	0.27	0.57

- Equations 3.1 and 3.3 are based on an elevation of approximately 6 feet. Equation 3.4 is based on a uniform particle diameter of 22 microns.
- The reported dates represent the first and last blowing dust or dust storm event during the 30-day period. The reported loadings and concentrations are calculated for a full 30 days.

TABLE 5-4  
LISTING OF EVENTS CONTAINED IN THE HIGHEST  
30 DAY TOTAL PARTICULATE LOADING  
(JULY 22 TO AUGUST 19, 1961)

Date	Type <sup>1</sup>	Time		Duration (hr)	Total Dust Loading (mg-hr/m <sup>3</sup> )	Elapsed Time (hr) Between <sup>2</sup>	
		Start	End			Any 2 Events	Dust Storms
1. 07/22	DS	1617	1626	0.15	13.3	1.87	1.87
2. 07/22	DS	1818	1941	1.38	473	120	144
3. 07/27	BD	1928	1953	0.42	2.9	24.0	---
4. 07/28	DS	1924	2026	1.03	448	144	164
5. 08/03	BD	2008	2134	1.43	8.8	9.40	---
6. 08/04	BD	0658	1158	5.00	16.2	4.13	---
7. 08/04	DS	1606	1637	0.52	121	101	339
8. 08/08	BD	2158	2205	0.12	0.4	51.0	---
9. 08/11	BD	0108	0228	1.33	6.6	88.1	---
10. 08/14	BD	1832	1834	0.03	0.3	96.8	---
11. 08/18	DS	1922	2043	1.35	127	23.3	---
12. 08/19	BD	1958	2008	0.17	0.5	---	---

1. DS = Dust Storm; BD = Blowing Dust

2. Time between any 2 events is the time from the end of an event to the beginning of the next event. Time between dust storms is the time from the end of a dust storm to the beginning of the next dust storm.

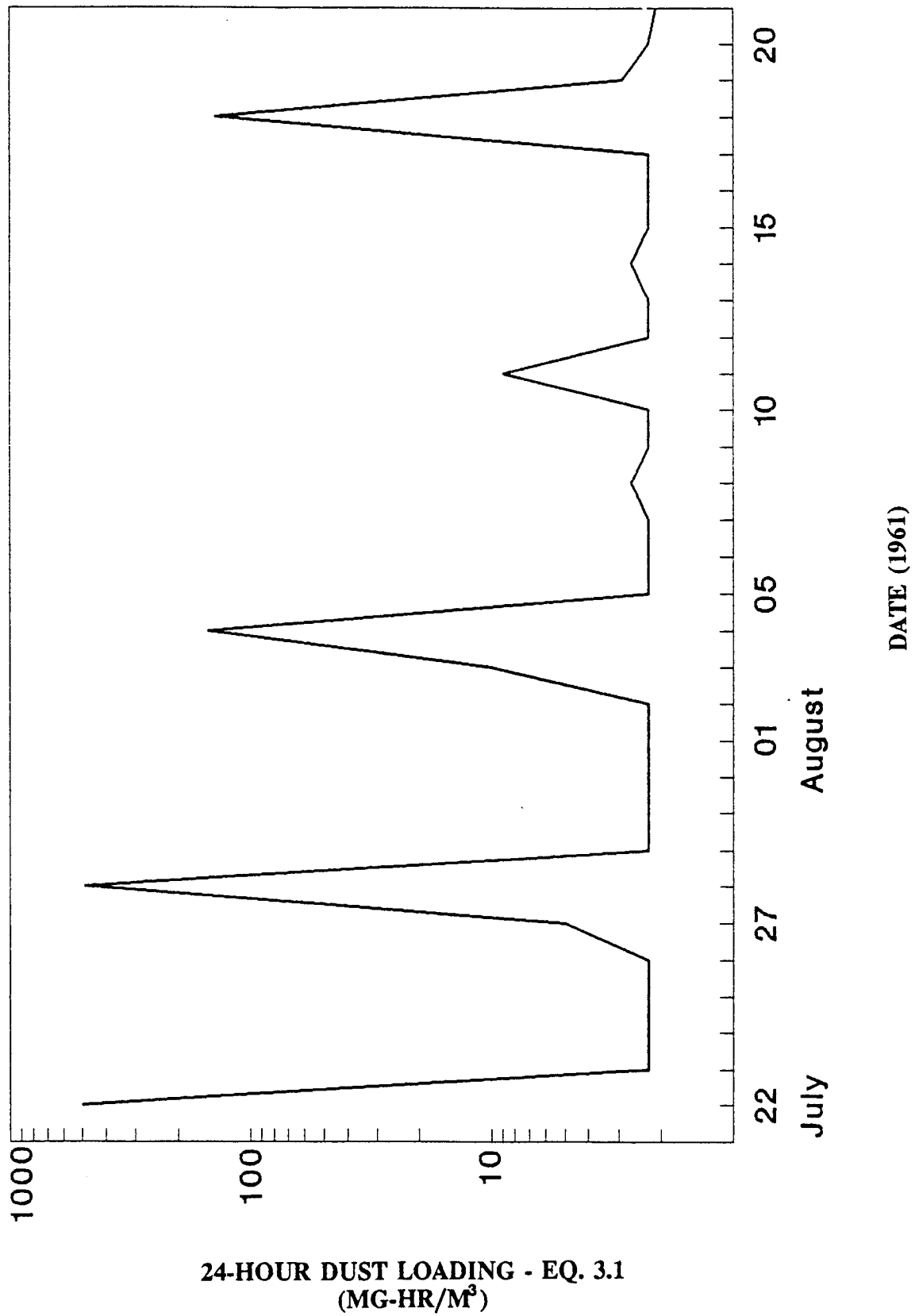


FIGURE 5-1 TOTAL 24-HOUR DUST LOADINGS (FROM EQUATION 3.1) FOR THE WORST CASE 30-DAY PERIOD IN THE 41 YEAR RECORD (JULY 22 TO AUGUST 19, 1961)



#### 5.4 Frequency of Occurrence, Average Duration and Average Total Particulate Loadings of Blowing Dust and Dust Storm Events

Table 5-5 shows the monthly variation in the frequency of occurrence, the average duration, and the average total particulate loading of all blowing dust and dust storm events for the 41 year data record. The maximum duration and maximum total particulate loadings, as calculated from the corresponding visibility data, of all events during each month are also listed in the same table. The data indicate:

- A total of 765 blowing dust and dust storm events between 1949 and 1989
- An average of 18.7 blowing dust or dust storm events per year
- An average duration of 0.86 hours
- An average total particulate loading of 22.74 mg-hr/m<sup>3</sup> (based on Equation 3.1)
- 56% of all blowing dust or dust storm events occur in July and August

Table 5-6 contains similar information to Table 5-5 for dust storm events only. A total of 165 of the 765 dust related events (21.6%) were dust storms, with the remaining 600 being blowing dust events. The 41 year data record indicates the following for dust storm events:

- An average of 4.0 dust storms per year
- An average duration of 0.89 hours per dust storm
- An average total particulate loading of 78.40 mg-hr/m<sup>3</sup> (based on Equation 3.1)
- 67% of dust storm events occur in the months of July and August
- 83% of dust storm events occur from June through September

The largest number of dust storms occurred in July (60 for the 41 year data record), followed by August (50), September (16), June (11) and May (10). The average total particulate loading (mg-hr/m<sup>3</sup>) was highest in March (101.8), followed by May (97.5), August (88.3) and July (83.2). The high average particulate loadings in March and May are believed to be due to dust storms caused by frontal systems moving through the area rather than thunderstorm cells which characterize summer dust storm events. It should be noted, however, that the maximum total loadings for worst case storms, 24-hour and 30-day worst case dust storms are due to dust storms which occur in the summer months.

TABLE 5-5  
SUMMARY OF BLOWING DUST AND DUST STORM EVENTS FOR 1949-1989 USING EQUATIONS 3.1, 3.3 AND 3.4  
(TOTAL NUMBER OF DUST EVENTS = 765)

Month	Events	% of Total	Freq. (yr <sup>-1</sup> )	Duration (hr)		Average Total Particulate Loading* (mg-hr/m <sup>3</sup> )			Maximum Total Particulate Loading* (mg-hr/m <sup>3</sup> )		
				Avg.	Max.	Eq. 3.1	Eq. 3.3	Eq. 3.4	Eq. 3.1	Eq. 3.3	Eq.3.4
Jan	11	1.44	0.27	0.85	4.12	6.75	3.03	9.53	35.7	16.4	52.0
Feb	20	2.61	0.49	1.42	5.55	14.8	6.34	19.6	73.3	31.7	97.7
Mar	45	5.88	1.10	1.45	9.32	16.5	6.32	19.0	177	58.1	169
Apr	38	4.97	0.93	1.82	8.95	21.6	9.10	7.89	152	61.8	186
May	42	5.49	1.02	1.10	4.53	27.9	9.00	25.3	343	88.0	222
Jun	63	8.24	1.54	0.82	3.18	15.4	5.20	15	246	62.3	157
Jul	232	30.33	5.66	0.71	7.03	25.1	7.46	20.3	473	116	287
Aug	197	25.75	4.81	0.61	5.00	28.5	8.11	21.7	605	144	352
Sep	65	8.50	1.59	0.53	1.73	18.6	5.84	16.2	270	68.3	172
Oct	26	3.40	0.63	1.24	6.50	14.9	5.57	16.6	109	25.8	71.4
Nov	15	1.96	0.37	1.57	4.38	13.0	5.87	18.4	49.1	19.2	60.3
Dec	11	1.44	0.27	1.41	5.22	8.45	4.03	12.9	41.6	19.5	62.0
Annual		100.0	18.70	0.86	9.33	22.7	7.17	20.0	605	144	352

\* Equations 3.1 and 3.3 are based on an elevation of 6 feet. Equation 3.4 is based on a uniform particle diameter of 22 microns.

TABLE 5-6  
SUMMARY OF DUST STORMS FOR 1949-1989 USING EQUATIONS 3.1, 3.3 AND 3.4  
(TOTAL NUMBER OF DUST STORMS = 165)

Month	Events	% of Total	Freq. (yr <sup>-1</sup> )	Duration (hr)		Average Total Particulate Loading* (mg-hr/m <sup>3</sup> )			Maximum Total Particulate Loading* (mg-hr/m <sup>3</sup> )		
				Avg.	Max.	Eq. 3.1	Eq. 3.3	Eq. 3.4	Eq. 3.1	Eq. 3.3	Eq.3.4
Jan	1	0.61	0.02	0.88	0.88	17.7	6.60	19.2	17.7	6.6	19.2
Feb	2	1.21	0.05	0.35	0.47	18.0	5.85	16.1	32.5	10.3	28.2
Mar	4	2.42	0.10	2.26	6.42	102	31.4	86.3	177	58.1	169
Apr	4	2.42	0.10	2.68	3.73	60.6	22.8	67	81.0	31.7	94.3
May	10	6.06	0.24	1.23	4.53	97.5	28.4	75.9	343	88.0	222
Jun	11	6.67	0.27	1.02	2.65	63.3	18.4	49.2	246	62.3	157
Jul	60	36.36	1.46	0.83	3.72	83.2	22.5	58.5	473	116	287
Aug	50	30.30	1.22	0.75	1.82	88.3	23.6	61	605	144	352
Sep	16	9.70	0.39	0.63	1.23	56.5	16.1	42.7	270	68.3	172
Oct	5	3.03	0.12	0.38	0.67	38	10.5	27.4	109	25.8	63.0
Nov	1	0.61	0.02	2.53	2.53	49.1	19.1	56.8	49.1	19.1	56.8
Dec	1	0.61	0.02	0.28	0.28	10.8	3.80	10.8	10.8	3.8	10.8
Annual		100.0	4.02	0.89	6.42	78.4	21.7	57.0	605	144	352

\* Equations 3.1 and 3.3 are based on an elevation of approximately 6 feet. Equation 3.4 is based on a uniform particle diameter of 22 microns.

## 5.5 Variation of Particulate Loading with Height

Typically, the abnormally high particulate concentrations during blowing dust and dust storm events result from wind erosion of surface soil with the more massive particulates being limited to near ground level. Therefore, it would be expected that particulate concentrations should decrease with height. The particulate concentration versus height above ground data is plotted in Figure 5-2 for the 1978 Palo Verde site data, the Chepil and Woodruff data, and the data from Washington Public Power Supply System (WPPSS) (References 1, 3 and 6, respectively). The Chepil and Woodruff data (represented by a plot of Equation 3.2), and the data from WPPSS (represented by individual data points and the average of the linear regression best fit lines), exhibit a linear relationship when plotted on a log-log scale. The Palo Verde data, however, exhibits an anomalous behavior with higher concentrations at 75 feet than at 40 feet above ground level. This is contrary to the anticipated behavior and indicates that this variation of particulate concentration data may be unreliable.

The ratio of particulate concentrations at different heights compared to the particulate concentration at six feet as predicted by the relationships in Figure 5-2, are shown in Table 5-7. Though the data is limited, using the most conservative relationship a reduction in particulate loading of approximately 40% could be realized in going from an elevation of 6 feet to an elevation of 35 feet.

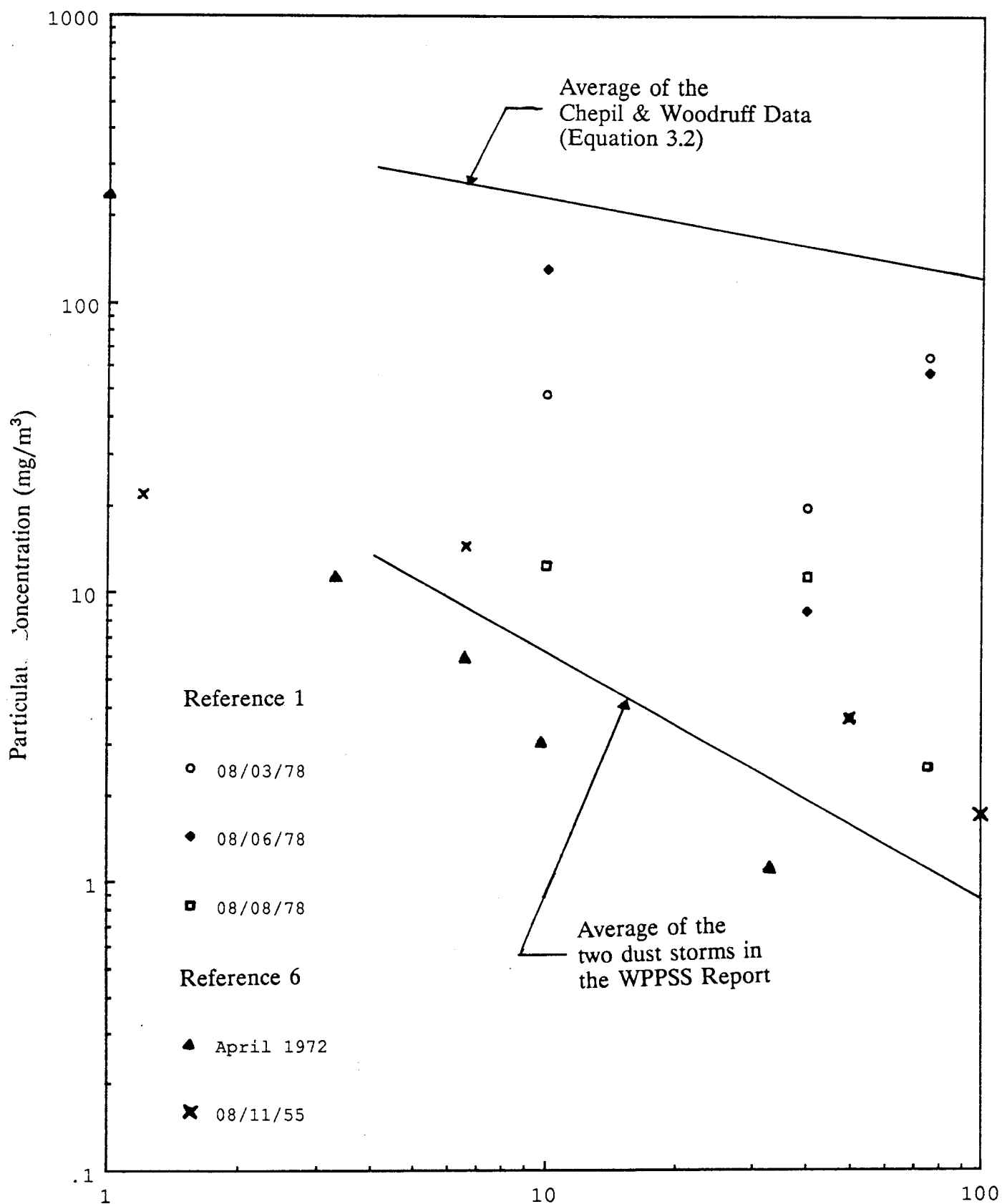


Figure 5-2 VARIATION OF PARTICULATE CONCENTRATION WITH THE HEIGHT ABOVE GROUND

TABLE 5-7  
RATIO OF PARTICULATE CONCENTRATION AT DIFFERENT  
HEIGHTS TO THE PARTICULATE CONCENTRATION  
AT 6 FEET

Height (ft)	$C_h/C_6$	
	Chepil & Woodruff <sup>1</sup>	Sehmel <sup>2</sup>
6	1.00	1.00
35	0.61	0.22
58	0.53	0.14
65	0.51	0.13
76	0.49	0.11
94	0.46	0.09

<sup>1</sup> Based on Equation 3.2.

<sup>2</sup> Average of the April 1972 and the August 11, 1955, WPPSS dust storms (References 5 and 6).

## 6.0 CONCLUSIONS

Details of the results of this study can be found throughout Section 5. The key points of the study are summarized below:

1. The utilization of the 30-consecutive day worst case climatological conditions for development of a design bases dust loading, similar to what is recommended by Regulatory Guide 1.27 for Ultimate Heat Sinks, is appropriate.
2. The utilization of Phoenix NWS visibility data to predict dust concentrations at the PVNGS site can be considered at least representative, if not conservative, based on terrain, weather patterns, and duration of available data. The 41 year record of data satisfies the Regulatory Guide 1.27 recommendation of utilizing a recent record of at least 30 years in length.
3. The relationship which correlates visibility to particulate concentration developed by Chepil and Woodruff is the most appropriate for developing a design bases loading. This is based on its previous use in a licensing submittal and the conclusion that the correlation represents the most conservative application of those identified in the literature search.
4. The values corresponding to the Standard Review Plan requirements of reporting the maximum annual frequency of occurrence and maximum time duration of dust storms are 9 storms per year and a storm with a maximum duration of 6.42 hours. It should be noted that the longest dust storm in duration did not yield the highest single event particulate loading.
5. The calculated worst case dust storm loading event lasted 1.62 hours with a total particulate loading of  $604.7 \text{ mg-hr/m}^3$  at a 6 foot elevation (an average particulate concentration of  $373 \text{ mg/m}^3$ ).
6. The highest calculated 30-day average particulate concentration (at 6 feet) is  $1.78 \text{ mg/m}^3$ . This corresponds to a particulate loading of  $1282 \text{ mg-hr/m}^3$ . This 30-day period included five dust storms (four major and one minor) but did not include the worst case dust storm (Item 5 above). However, it did include the second and fifth worst particulate loading events on record.
7. Based on very limited available data, it is believed that particulate concentrations decrease with increasing height above ground level. As shown in Table 5-6, the most conservative data would indicate that the particulate concentration reduction due to an elevation change from 6 feet to 35 feet could be approximately 40%.
8. An appropriate design bases loading for the PVNGS site would consider an initial loading (prior to accident) plus the loading from the worst 30-consecutive day historical conditions (utilizing the highest calculated 30-day average particulate concentration), or taking credit for operator action. In addition, an evaluation that the worst case 24-hour event can be handled would also be required.

## 7.0 REFERENCES

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**APPENDIX A**

**Computerized Data Base of Visibility Observations  
at Phoenix Sky Harbor Airport (1949-1989)**

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
01 09 49	1300	1320	4.0000	7.0000
03 20 49	0118	0120	2.0000	7.0000
03 23 49	1214	1226	3.0000	7.0000
06 09 49	1600	1605	6.0000	1.5000
06 09 49	1605	1626	1.5000	7.0000
06 17 49	1825	1855	6.0000	7.0000
07 02 49	0428	0440	6.0000	3.0000
07 02 49	0440	0445	3.0000	7.0000
07 03 49	1920	1936	0.7500	3.0000
07 03 49	1936	1940	3.0000	7.0000
07 09 49	1918	1955	6.0000	7.0000
07 10 49	1910	1918	1.0000	2.0000
07 10 49	1918	1928	2.0000	3.0000
07 10 49	1928	1947	3.0000	6.0000
07 10 49	1947	2015	6.0000	1.5000
07 10 49	2015	2021	1.5000	7.0000
07 18 49	0144	0227	5.0000	6.0000
07 18 49	0227	0300	6.0000	6.0000
07 18 49	0300	0327	6.0000	7.0000
07 18 49	0500	0527	6.0000	3.0000
07 18 49	0527	0605	3.0000	3.0000
07 18 49	0605	0628	3.0000	4.0000
07 18 49	0628	0700	4.0000	4.0000
07 18 49	0700	0728	4.0000	5.0000
07 18 49	0728	0757	5.0000	5.0000
07 18 49	0757	0902	5.0000	6.0000
07 18 49	0902	1126	6.0000	6.0000
07 18 49	1126	1202	6.0000	7.0000
07 19 49	2210	2219	4.0000	1.5000
07 19 49	2219	2230	1.5000	3.0000
07 19 49	2230	2255	3.0000	7.0000
07 21 49	1226	1326	6.0000	6.0000
07 21 49	1326	1400	6.0000	7.0000
07 30 49	2114	2128	1.5000	7.0000
07 30 49	2214	2220	1.0000	0.5000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 30 49	2220	2225	0.5000	3.0000
07 30 49	2225	2228	3.0000	3.0000
07 30 49	2228	2235	3.0000	7.0000
08 02 49	2022	2028	0.0000	0.0000
08 02 49	2028	2045	0.0000	0.7500
08 02 49	2045	2058	0.7500	2.0000
08 02 49	2058	2128	2.0000	3.0000
08 02 49	2128	2129	3.0000	7.0000
08 02 49	2220	2245	1.0000	2.0000
08 02 49	2245	2259	2.0000	4.0000
08 02 49	2259	2326	4.0000	6.0000
08 02 49	2326	2345	6.0000	7.0000
08 04 49	2152	2205	5.0000	7.0000
08 06 49	1728	1730	5.0000	0.0000
08 06 49	1730	1738	0.0000	7.0000
08 08 49	2005	2020	6.0000	7.0000
09 22 49	1707	1715	0.5000	0.5000
09 22 49	1715	1725	0.5000	1.5000
09 22 49	1725	1730	1.5000	7.0000
10 04 49	1235	1250	6.0000	7.0000
10 14 49	1654	1707	6.0000	6.0000
10 14 49	1707	1720	6.0000	7.0000
03 25 50	1009	1016	5.0000	2.0000
03 25 50	1016	1020	2.0000	1.0000
03 25 50	1020	1023	1.0000	0.0000
03 25 50	1023	1030	0.0000	0.0000
03 25 50	1030	1032	0.0000	0.2500
03 25 50	1032	1040	0.2500	3.0000
03 25 50	1040	1045	3.0000	3.0000
03 25 50	1045	1048	3.0000	7.0000
03 25 50	1803	1829	5.0000	5.0000
03 25 50	1829	1902	5.0000	7.0000
05 04 50	0405	0425	5.0000	7.0000
05 04 50	0502	0527	5.0000	7.0000
06 21 50	1928	1942	0.5000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 01 50	2000	2028	4.0000	7.0000
07 02 50	1815	1828	3.0000	2.0000
07 02 50	1828	1840	2.0000	3.0000
07 02 50	1840	1855	3.0000	6.0000
07 02 50	1855	1925	6.0000	6.0000
07 02 50	1925	1945	6.0000	7.0000
07 05 50	0155	0205	3.0000	7.0000
07 21 50	1814	1827	0.0000	0.5000
07 21 50	1827	1849	0.5000	5.0000
07 21 50	1849	1850	5.0000	7.0000
07 22 50	2008	2027	1.0000	3.0000
07 22 50	2027	2035	3.0000	0.0000
07 22 50	2035	2109	0.0000	5.0000
07 22 50	2109	2127	5.0000	7.0000
08 18 50	1758	1820	6.0000	7.0000
08 23 50	2155	2205	0.5000	3.0000
08 23 50	2205	2210	3.0000	1.0000
08 23 50	2210	2228	1.0000	3.0000
08 23 50	2228	2257	3.0000	7.0000
08 28 50	1902	1912	2.0000	0.7500
08 28 50	1912	1928	0.7500	4.0000
08 28 50	1928	2028	4.0000	4.0000
08 28 50	2028	2055	4.0000	7.0000
09 02 50	2006	2007	4.0000	4.0000
09 02 50	2007	2025	4.0000	7.0000
09 02 50	2050	2055	1.0000	0.0625
09 02 50	2055	2059	0.0625	1.0000
09 02 50	2059	2108	1.0000	7.0000
09 03 50	1800	1807	0.2500	0.5000
09 03 50	1807	1828	0.5000	0.5000
09 03 50	1828	1838	0.5000	0.0625
09 03 50	1838	1843	0.0625	0.0000
09 03 50	1843	1850	0.0000	7.0000
09 05 50	1918	1928	4.0000	1.0000
09 05 50	1928	1946	1.0000	3.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
09 05 50	1946	2000	3.0000	6.0000
09 05 50	2000	2006	6.0000	7.0000
11 09 50	2229	2310	2.5000	1.5000
11 09 50	2310	2328	1.5000	1.5000
11 09 50	2328	2359	1.5000	2.0000
11 09 50	2359	2400	2.0000	2.0000
11 10 50	0000	0028	2.0000	3.0000
11 10 50	0028	0125	3.0000	3.0000
11 10 50	0125	0155	3.0000	5.0000
11 10 50	0155	0229	5.0000	5.0000
11 10 50	0229	0252	5.0000	7.0000
12 31 50	1313	1328	3.0000	2.5000
12 31 50	1328	1340	2.5000	6.0000
12 31 50	1340	1400	6.0000	6.0000
12 31 50	1400	1405	6.0000	7.0000
03 30 51	1705	1720	6.0000	7.0000
05 31 51	1612	1630	2.0000	2.5000
05 31 51	1630	1655	2.5000	4.0000
05 31 51	1655	1710	4.0000	7.0000
07 11 51	1930	1949	1.5000	3.0000
07 11 51	1949	2008	3.0000	6.0000
07 11 51	2008	2013	6.0000	7.0000
07 15 51	1945	2005	1.0000	3.0000
07 15 51	2005	2030	3.0000	3.0000
07 15 51	2030	2100	3.0000	5.0000
07 15 51	2100	2106	5.0000	7.0000
07 16 51	2200	2228	6.0000	6.0000
07 16 51	2228	2234	6.0000	7.0000
07 17 51	2328	2357	5.0000	5.0000
07 17 51	2357	2400	5.0000	5.0000
07 18 51	0000	0028	5.0000	3.0000
07 18 51	0028	0100	3.0000	7.0000
07 23 51	2144	2148	0.0000	2.0000
07 23 51	2148	2155	2.0000	6.0000
07 23 51	2155	2228	6.0000	6.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 23 51	2228	2236	6.0000	7.0000
07 27 51	1720	1729	0.0000	0.0000
07 27 51	1729	1735	0.0000	0.2500
07 27 51	1735	1745	0.2500	1.0000
07 27 51	1745	1800	1.0000	0.5000
07 27 51	1800	1810	0.5000	2.0000
07 27 51	1810	1820	2.0000	7.0000
07 30 51	2030	2033	6.0000	7.0000
08 02 51	0338	0343	2.0000	0.0000
08 02 51	0343	0358	0.0000	0.0000
08 02 51	0358	0412	0.0000	0.2500
08 02 51	0412	0428	0.2500	4.0000
08 02 51	0428	0442	4.0000	7.0000
08 02 51	2338	2345	1.5000	1.0000
08 02 51	2345	2355	1.0000	3.0000
08 02 51	2355	2400	3.0000	3.0000
08 03 51	0000	0008	3.0000	7.0000
08 14 51	2218	2228	0.1250	2.0000
08 14 51	2228	2243	2.0000	3.0000
08 14 51	2243	2255	3.0000	7.0000
08 14 51	2319	2330	0.0000	0.0000
08 14 51	2330	2343	0.0000	7.0000
08 20 51	1847	1852	0.1250	0.5000
08 20 51	1852	1900	0.5000	1.0000
08 20 51	1900	1905	1.0000	5.0000
08 20 51	1905	1928	5.0000	5.0000
08 20 51	1928	1950	5.0000	7.0000
08 26 51	1528	1532	6.0000	7.0000
08 26 51	1805	1808	6.0000	7.0000
09 28 51	2228	2238	0.2500	4.0000
09 28 51	2238	2250	4.0000	7.0000
10 25 51	1042	1100	1.0000	0.5000
10 25 51	1100	1115	0.5000	7.0000
10 25 51	1238	1250	0.5000	3.0000
10 25 51	1250	1301	3.0000	3.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
10 25 51	1301	1310	3.0000	7.0000
12 05 51	1105	1120	6.0000	7.0000
03 08 52	1708	1712	0.1250	0.5000
03 08 52	1712	1757	0.5000	6.0000
03 08 52	1757	1801	6.0000	6.0000
03 08 52	1801	1810	6.0000	7.0000
04 24 52	1757	1800	2.0000	3.0000
04 24 52	1800	1825	3.0000	7.0000
06 02 52	1430	1445	6.0000	7.0000
07 04 52	1700	1730	4.0000	6.0000
07 04 52	1730	1732	6.0000	7.0000
07 23 52	1851	1856	0.0625	0.2500
07 23 52	1856	1911	0.2500	2.0000
07 23 52	1911	1917	2.0000	3.0000
07 23 52	1917	1930	3.0000	3.0000
07 23 52	1930	1950	3.0000	6.0000
07 23 52	1950	2002	6.0000	7.0000
07 26 52	1940	1944	0.0625	0.2500
07 26 52	1944	1948	0.2500	0.7500
07 26 52	1948	1950	0.7500	1.5000
07 26 52	1950	1955	1.5000	3.0000
07 26 52	1955	2010	3.0000	7.0000
08 08 52	1921	1929	4.0000	1.0000
08 08 52	1929	1944	1.0000	3.0000
08 08 52	1944	1951	3.0000	7.0000
08 15 52	1844	1852	0.5000	0.0625
08 15 52	1852	1858	0.0625	1.0000
08 15 52	1858	1910	1.0000	6.0000
08 15 52	1910	1913	6.0000	7.0000
08 25 52	1900	1905	0.1250	0.5000
08 25 52	1905	1910	0.5000	1.5000
08 25 52	1910	1920	1.5000	3.0000
08 25 52	1920	1928	3.0000	5.0000
08 25 52	1928	1933	5.0000	7.0000
08 27 52	0329	0400	5.0000	5.0000



COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 27 52	0400	0429	5.0000	4.0000
08 27 52	0429	0500	4.0000	7.0000
11 03 52	1013	1030	6.0000	6.0000
11 03 52	1030	1100	6.0000	4.0000
11 03 52	1100	1212	4.0000	6.0000
11 03 52	1212	1220	6.0000	7.0000
02 08 53	1121	1130	1.0000	3.0000
02 08 53	1130	1155	3.0000	6.0000
02 08 53	1155	1206	6.0000	6.0000
02 08 53	1206	1215	6.0000	7.0000
02 23 53	1330	1410	5.0000	7.0000
02 23 53	1513	1530	5.0000	5.0000
02 23 53	1530	1605	5.0000	4.0000
02 23 53	1605	1628	4.0000	4.0000
02 23 53	1628	1703	4.0000	5.0000
02 23 53	1703	1728	5.0000	3.0000
02 23 53	1728	1828	3.0000	3.0000
02 23 53	1828	1900	3.0000	7.0000
03 20 53	1400	1430	5.0000	6.0000
03 20 53	1430	1445	6.0000	7.0000
03 20 53	1710	1730	6.0000	6.0000
03 20 53	1730	1800	6.0000	7.0000
03 29 53	1328	1428	6.0000	5.0000
03 29 53	1428	1558	5.0000	5.0000
03 29 53	1558	1630	5.0000	6.0000
03 29 53	1630	1728	6.0000	6.0000
03 29 53	1728	1745	6.0000	7.0000
04 10 53	1656	1810	5.0000	5.0000
04 10 53	1810	1830	5.0000	6.0000
04 10 53	1830	1900	6.0000	5.0000
04 10 53	1900	1928	5.0000	6.0000
04 10 53	1928	2000	6.0000	7.0000
07 07 53	1814	1818	3.0000	7.0000
07 12 53	2255	2330	5.0000	5.0000
07 12 53	2330	2338	5.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 16 53	1858	1906	4.0000	7.0000
07 24 53	2013	2030	5.0000	5.0000
07 24 53	2030	2038	5.0000	7.0000
07 26 53	1945	2004	4.0000	7.0000
07 29 53	2028	2031	5.0000	7.0000
08 08 53	1855	1908	2.0000	4.0000
08 08 53	1908	1930	4.0000	4.0000
08 08 53	1930	1937	4.0000	7.0000
08 14 53	2030	2040	3.0000	3.0000
08 14 53	2040	2048	3.0000	5.0000
08 14 53	2048	2109	5.0000	7.0000
08 20 53	1930	1944	2.0000	3.0000
08 20 53	1944	2000	3.0000	6.0000
08 20 53	2000	2015	6.0000	7.0000
08 20 53	2130	2153	4.0000	7.0000
08 25 53	1850	1905	1.5000	7.0000
09 27 53	1500	1504	5.0000	7.0000
10 04 53	0708	0730	6.0000	6.0000
10 04 53	0730	0803	6.0000	4.0000
10 04 53	0803	0830	4.0000	4.0000
10 04 53	0830	0913	4.0000	1.5000
10 04 53	0913	0930	1.5000	1.5000
10 04 53	0930	1000	1.5000	3.0000
10 04 53	1000	1030	3.0000	3.0000
10 04 53	1030	1114	3.0000	5.0000
10 04 53	1114	1128	5.0000	5.0000
10 04 53	1128	1214	5.0000	6.0000
10 04 53	1214	1310	6.0000	6.0000
10 04 53	1310	1315	6.0000	7.0000
10 22 53	1230	1300	6.0000	3.0000
10 22 53	1300	1330	3.0000	6.0000
10 22 53	1330	1402	6.0000	6.0000
10 22 53	1402	1403	6.0000	7.0000
12 04 53	1648	1705	0.5000	7.0000
03 11 54	0728	0745	4.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
03 11 54	0830	1028	5.0000	5.0000
03 11 54	1028	1105	5.0000	2.0000
03 11 54	1105	1128	2.0000	2.0000
03 11 54	1128	1145	2.0000	5.0000
03 11 54	1145	1200	5.0000	2.0000
03 11 54	1200	1228	2.0000	0.2500
03 11 54	1228	1235	0.2500	0.7500
03 11 54	1235	1300	0.7500	0.7500
03 11 54	1300	1328	0.7500	0.5000
03 11 54	1328	1400	0.5000	1.0000
03 11 54	1400	1414	1.0000	5.0000
03 11 54	1414	1428	5.0000	5.0000
03 11 54	1428	1455	5.0000	7.0000
03 11 54	1530	1539	6.0000	7.0000
04 30 54	1810	1813	1.0000	0.5000
04 30 54	1813	1819	0.5000	1.0000
04 30 54	1819	1909	1.0000	1.0000
04 30 54	1909	1928	1.0000	2.0000
04 30 54	1928	2030	2.0000	7.0000
04 30 54	2130	2230	4.0000	7.0000
05 01 54	0605	0630	5.0000	6.0000
05 01 54	0630	0705	6.0000	7.0000
05 17 54	1712	1730	1.0000	3.0000
05 17 54	1730	1757	3.0000	7.0000
05 18 54	1905	1928	3.0000	3.0000
05 18 54	1928	1948	3.0000	5.0000
05 18 54	1948	2020	5.0000	7.0000
05 20 54	1848	1852	0.1250	0.0625
05 20 54	1852	1905	0.0625	0.1250
05 20 54	1905	1920	0.1250	0.1250
05 20 54	1920	1930	0.1250	1.0000
05 20 54	1930	1940	1.0000	7.0000
06 30 54	1844	1900	3.0000	1.0000
06 30 54	1900	1912	1.0000	4.0000
06 30 54	1912	1929	4.0000	2.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
06 30 54	1929	1945	2.0000	5.0000
06 30 54	1945	2005	5.0000	7.0000
07 02 54	1730	1738	6.0000	7.0000
07 08 54	2100	2108	4.0000	7.0000
07 10 54	2150	2210	0.5000	2.0000
07 10 54	2210	2220	2.0000	3.0000
07 10 54	2220	2300	3.0000	7.0000
07 12 54	1730	1736	6.0000	0.1250
07 12 54	1736	1750	0.1250	4.0000
07 12 54	1750	1800	4.0000	7.0000
07 15 54	0828	0907	6.0000	5.0000
07 15 54	0907	0928	5.0000	2.0000
07 15 54	0928	1029	2.0000	4.0000
07 15 54	1029	1105	4.0000	6.0000
07 15 54	1105	1111	6.0000	7.0000
07 16 54	1930	2028	6.0000	6.0000
07 16 54	2028	2032	6.0000	7.0000
07 20 54	1932	1935	0.1250	0.5000
07 20 54	1935	1944	0.5000	0.0625
07 20 54	1944	1945	0.0625	0.5000
07 20 54	1945	1946	0.5000	1.0000
07 20 54	1946	2000	1.0000	3.0000
07 20 54	2000	2010	3.0000	3.0000
07 20 54	2010	2017	3.0000	7.0000
07 31 54	1905	1917	4.0000	7.0000
07 31 54	2150	2157	1.5000	2.0000
07 31 54	2157	2217	2.0000	7.0000
07 31 54	2258	2328	4.0000	6.0000
07 31 54	2328	2335	6.0000	7.0000
08 03 54	2006	2012	6.0000	7.0000
08 31 54	1933	1947	0.0000	4.0000
08 31 54	1947	2007	4.0000	7.0000
09 01 54	2028	2040	3.0000	7.0000
09 11 54	1640	1650	0.0000	0.5000
09 11 54	1650	1657	0.5000	1.2500

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
09 11 54	1657	1710	1.2500	7.0000
10 24 54	0600	0629	6.0000	4.0000
10 24 54	0629	0658	4.0000	2.0000
10 24 54	0658	0710	2.0000	1.0000
10 24 54	0710	0728	1.0000	1.5000
10 24 54	0728	0800	1.5000	2.0000
10 24 54	0800	0828	2.0000	3.0000
10 24 54	0828	0900	3.0000	4.0000
10 24 54	0900	0928	4.0000	5.0000
10 24 54	0928	1104	5.0000	5.0000
10 24 54	1104	1130	5.0000	6.0000
10 24 54	1130	1206	6.0000	6.0000
10 24 54	1206	1230	6.0000	7.0000
11 10 54	1208	1229	6.0000	2.0000
11 10 54	1229	1246	2.0000	5.0000
11 10 54	1246	1330	5.0000	6.0000
11 10 54	1330	1340	6.0000	7.0000
12 27 54	0930	1015	6.0000	7.0000
12 27 54	1105	1128	4.0000	4.0000
12 27 54	1128	1200	4.0000	7.0000
02 18 55	1110	1128	5.0000	5.0000
02 18 55	1128	1205	5.0000	3.0000
02 18 55	1205	1230	3.0000	6.0000
02 18 55	1230	1305	6.0000	4.0000
02 18 55	1305	1325	4.0000	7.0000
03 20 55	1328	1350	2.0000	1.0000
03 20 55	1350	1400	1.0000	2.0000
03 20 55	1400	1428	2.0000	2.0000
03 20 55	1428	1500	2.0000	5.0000
03 20 55	1500	1528	5.0000	5.0000
03 20 55	1528	1558	5.0000	6.0000
03 20 55	1558	1628	6.0000	5.0000
03 20 55	1628	1705	5.0000	5.0000
03 20 55	1705	1725	5.0000	7.0000
03 26 55	1828	1928	3.0000	3.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
03 26 55	1928	2028	3.0000	5.0000
03 26 55	2028	2400	5.0000	5.0000
03 27 55	0000	0130	5.0000	5.0000
03 27 55	0130	0215	5.0000	7.0000
03 27 55	0502	0730	6.0000	6.0000
03 27 55	0730	0745	6.0000	7.0000
04 11 55	1228	1240	6.0000	2.0000
04 11 55	1240	1305	2.0000	2.0000
04 11 55	1305	1328	2.0000	6.0000
04 11 55	1328	1345	6.0000	7.0000
04 22 55	1400	1428	4.0000	3.0000
04 22 55	1428	1500	3.0000	7.0000
07 12 55	1724	1729	0.0000	0.2500
07 12 55	1729	1733	0.2500	0.7500
07 12 55	1733	1738	0.7500	2.0000
07 12 55	1738	1749	2.0000	3.0000
07 12 55	1749	1803	3.0000	6.0000
07 12 55	1803	1804	6.0000	7.0000
07 15 55	1658	1709	0.7500	4.0000
07 15 55	1709	1723	4.0000	7.0000
07 16 55	1918	1923	0.7500	0.0625
07 16 55	1923	1930	0.0625	0.7500
07 16 55	1930	1937	0.7500	1.5000
07 16 55	1937	1943	1.5000	4.0000
07 16 55	1943	1950	4.0000	6.0000
07 16 55	1950	2008	6.0000	7.0000
07 18 55	1930	1945	1.0000	3.0000
07 18 55	1945	1955	3.0000	2.0000
07 18 55	1955	2007	2.0000	7.0000
07 20 55	2013	2028	4.0000	7.0000
07 22 55	2028	2038	0.0000	2.0000
07 22 55	2038	2047	2.0000	6.0000
07 22 55	2047	2053	6.0000	7.0000
07 23 55	1630	1636	0.2500	0.5000
07 23 55	1636	1641	0.5000	2.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 23 55	1641	1647	2.0000	7.0000
07 29 55	1800	1810	5.0000	3.0000
07 29 55	1810	1830	3.0000	5.0000
07 29 55	1830	1832	5.0000	7.0000
08 02 55	0354	0412	0.5000	3.0000
08 02 55	0412	0430	3.0000	4.0000
08 02 55	0430	0452	4.0000	7.0000
08 30 55	1810	1830	5.0000	5.0000
08 30 55	1830	1852	5.0000	7.0000
03 06 56	1029	1118	3.0000	1.5000
03 06 56	1118	1128	1.5000	1.5000
03 06 56	1128	1228	1.5000	1.0000
03 06 56	1228	1245	1.0000	1.0000
03 06 56	1245	1303	1.0000	4.0000
03 06 56	1303	1322	4.0000	7.0000
03 06 56	1500	1528	4.0000	1.0000
03 06 56	1528	1550	1.0000	0.7500
03 06 56	1550	1615	0.7500	1.5000
03 06 56	1615	1627	1.5000	1.5000
03 06 56	1627	1700	1.5000	3.0000
03 06 56	1700	1728	3.0000	3.0000
03 06 56	1728	1748	3.0000	7.0000
04 11 56	0328	0428	6.0000	3.0000
04 11 56	0428	0442	3.0000	2.0000
04 11 56	0442	0528	2.0000	2.0000
04 11 56	0528	0603	2.0000	4.0000
04 11 56	0603	0628	4.0000	2.5000
04 11 56	0628	0700	2.5000	2.0000
04 11 56	0700	0728	2.0000	1.5000
04 11 56	0728	0805	1.5000	1.5000
04 11 56	0805	0818	1.5000	2.0000
04 11 56	0818	0826	2.0000	2.0000
04 11 56	0826	0918	2.0000	3.0000
04 11 56	0918	1128	3.0000	3.0000
04 11 56	1128	1225	3.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
06 28 56	1941	2000	0.5000	0.5000
06 28 56	2000	2028	0.5000	4.0000
06 28 56	2028	2128	4.0000	5.0000
06 28 56	2128	2220	5.0000	7.0000
06 29 56	1730	1735	2.5000	1.0000
06 29 56	1735	1755	1.0000	2.0000
06 29 56	1755	1800	2.0000	4.0000
06 29 56	1800	1801	4.0000	7.0000
07 10 56	2140	2145	0.0000	0.2500
07 10 56	2145	2147	0.2500	1.0000
07 10 56	2147	2156	1.0000	2.0000
07 10 56	2156	2210	2.0000	4.0000
07 10 56	2210	2215	4.0000	7.0000
07 23 56	2342	2357	0.7500	0.1250
07 23 56	2357	2400	0.1250	1.0000
07 24 56	0000	0002	1.0000	1.0000
07 24 56	0002	0028	1.0000	2.0000
07 24 56	0028	0044	2.0000	3.0000
07 24 56	0044	0119	3.0000	7.0000
07 25 56	1545	1552	0.0000	0.2500
07 25 56	1552	1606	0.2500	0.2500
07 25 56	1606	1612	0.2500	7.0000
08 17 56	1909	1912	0.2500	0.2500
08 17 56	1912	1929	0.2500	0.7500
08 17 56	1929	1937	0.7500	3.0000
08 17 56	1937	2006	3.0000	7.0000
08 22 56	1700	1715	1.0000	1.0000
08 22 56	1715	1730	1.0000	7.0000
08 27 56	1828	1900	2.0000	2.0000
08 27 56	1900	1930	2.0000	4.0000
08 27 56	1930	2028	4.0000	6.0000
08 27 56	2028	2043	6.0000	7.0000
09 06 56	1540	1555	4.0000	7.0000
09 06 56	1730	1745	0.5000	4.0000
09 06 56	1745	1800	4.0000	7.0000



COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
09 30 56	1628	1645	0.2500	1.0000
09 30 56	1645	1648	1.0000	3.0000
09 30 56	1648	1649	3.0000	7.0000
11 19 56	1313	1335	4.0000	5.0000
11 19 56	1335	1400	5.0000	7.0000
11 19 56	1528	1628	3.0000	5.0000
11 19 56	1628	1700	5.0000	7.0000
12 09 56	1428	1445	6.0000	7.0000
04 01 57	0928	0955	2.5000	0.5000
04 01 57	0955	1030	0.5000	1.5000
04 01 57	1030	1129	1.5000	1.5000
04 01 57	1129	1215	1.5000	3.0000
04 01 57	1215	1300	3.0000	3.0000
04 01 57	1300	1312	3.0000	7.0000
05 06 57	1428	1431	6.0000	1.0000
05 06 57	1431	1437	1.0000	3.0000
05 06 57	1437	1449	3.0000	7.0000
06 03 57	2110	2115	0.2500	1.0000
06 03 57	2115	2131	1.0000	5.0000
06 03 57	2131	2158	5.0000	6.0000
06 03 57	2158	2218	6.0000	7.0000
06 05 57	1858	1915	6.0000	7.0000
06 28 57	1900	2000	6.0000	7.0000
07 04 57	2130	2158	6.0000	0.2500
07 04 57	2158	2212	0.2500	1.0000
07 04 57	2212	2225	1.0000	1.5000
07 04 57	2225	2243	1.5000	1.0000
07 04 57	2243	2300	1.0000	1.5000
07 04 57	2300	2318	1.5000	3.0000
07 04 57	2318	2358	3.0000	3.0000
07 04 57	2358	2400	3.0000	3.0000
07 05 57	0000	0058	3.0000	6.0000
07 05 57	0058	0113	6.0000	7.0000
07 06 57	2245	2258	0.0625	0.0625
07 06 57	2258	2305	0.0625	3.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 06 57	2305	2307	3.0000	7.0000
07 09 57	0100	0115	2.0000	1.0000
07 09 57	0115	0130	1.0000	2.0000
07 09 57	0130	0145	2.0000	4.0000
07 09 57	0145	0200	4.0000	4.0000
07 09 57	0200	0215	4.0000	7.0000
07 09 57	2005	2008	0.2500	1.0000
07 09 57	2008	2020	1.0000	3.0000
07 09 57	2020	2058	3.0000	3.0000
07 09 57	2058	2100	3.0000	7.0000
07 10 57	2100	2158	6.0000	5.0000
07 10 57	2158	2230	5.0000	4.0000
07 10 57	2230	2244	4.0000	7.0000
07 16 57	2000	2022	1.0000	3.0000
07 16 57	2022	2059	3.0000	5.0000
07 16 57	2059	2123	5.0000	7.0000
07 18 57	1720	1752	3.0000	7.0000
07 24 57	1810	1820	1.0000	7.0000
07 25 57	1759	1818	0.7500	4.0000
07 25 57	1818	1858	4.0000	7.0000
07 26 57	1358	1438	5.0000	7.0000
07 31 57	1908	1912	0.1250	0.5000
07 31 57	1912	1915	0.5000	0.2500
07 31 57	1915	1930	0.2500	0.5000
07 31 57	1930	1944	0.5000	0.7500
07 31 57	1944	2000	0.7500	0.7500
07 31 57	2000	2015	0.7500	1.0000
07 31 57	2015	2030	1.0000	2.0000
07 31 57	2030	2059	2.0000	2.0000
07 31 57	2059	2104	2.0000	4.0000
07 31 57	2104	2132	4.0000	7.0000
08 04 57	1558	1652	0.0000	7.0000
08 15 57	1958	2007	5.0000	7.0000
08 16 57	1910	1930	1.0000	3.0000
08 16 57	1930	1945	3.0000	6.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 16 57	1945	2000	6.0000	6.0000
08 16 57	2000	2002	6.0000	7.0000
08 17 57	2200	2258	4.0000	7.0000
08 19 57	1600	1612	3.0000	7.0000
08 20 57	1810	1822	0.2500	0.5000
08 20 57	1822	1830	0.5000	1.0000
08 20 57	1830	1835	1.0000	3.0000
08 20 57	1835	1843	3.0000	7.0000
08 22 57	2040	2100	3.0000	3.0000
08 22 57	2100	2111	3.0000	7.0000
11 21 57	1658	1730	6.0000	7.0000
01 18 58	1646	1700	2.0000	3.0000
01 18 58	1700	1730	3.0000	7.0000
06 15 58	1628	1645	2.5000	6.0000
06 15 58	1645	1658	6.0000	2.0000
06 15 58	1658	1708	2.0000	1.0000
06 15 58	1708	1726	1.0000	3.0000
06 15 58	1726	1755	3.0000	7.0000
06 28 58	1715	1719	1.0000	7.0000
07 28 58	2238	2245	2.5000	7.0000
08 10 58	2058	2110	2.0000	3.0000
08 10 58	2110	2115	3.0000	7.0000
08 23 58	1758	1806	2.0000	6.0000
08 23 58	1806	1815	6.0000	7.0000
09 06 58	1558	1605	2.0000	7.0000
09 10 58	2028	2055	6.0000	7.0000
09 26 58	1515	1520	1.0000	7.0000
06 12 59	1749	1755	1.0000	3.0000
06 12 59	1755	1807	3.0000	5.0000
06 12 59	1807	1827	5.0000	7.0000
06 13 59	1748	1758	0.1250	1.0000
06 13 59	1758	1805	1.0000	3.0000
06 13 59	1805	1840	3.0000	7.0000
06 14 59	1812	1835	3.0000	5.0000
06 14 59	1835	1844	5.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 03 59	2120	2128	0.5000	0.2500
07 03 59	2128	2141	0.2500	3.0000
07 03 59	2141	2158	3.0000	3.0000
07 03 59	2158	2230	3.0000	7.0000
07 06 59	1958	2010	0.5000	0.2500
07 06 59	2010	2019	0.2500	2.0000
07 06 59	2019	2024	2.0000	3.0000
07 06 59	2024	2043	3.0000	7.0000
07 09 59	1758	1800	0.2500	1.0000
07 09 59	1800	1815	1.0000	3.0000
07 09 59	1815	1831	3.0000	7.0000
07 11 59	1845	1859	1.0000	7.0000
07 11 59	2130	2158	0.0000	0.5000
07 11 59	2158	2214	0.5000	1.0000
07 11 59	2214	2221	1.0000	3.0000
07 11 59	2221	2335	3.0000	3.0000
07 11 59	2335	2358	3.0000	5.0000
07 11 59	2358	2400	5.0000	5.0000
07 12 59	0000	0030	5.0000	6.0000
07 12 59	0030	0058	6.0000	7.0000
07 13 59	2258	2358	5.0000	6.0000
07 13 59	2358	2400	6.0000	6.0000
07 14 59	0000	0005	6.0000	7.0000
07 17 59	1843	1845	1.0000	7.0000
07 17 59	2035	2050	5.0000	7.0000
07 18 59	0058	0124	5.0000	7.0000
07 18 59	2234	2240	0.2500	0.5000
07 18 59	2240	2258	0.5000	0.5000
07 18 59	2258	2301	0.5000	1.5000
07 18 59	2301	2318	1.5000	4.0000
07 18 59	2318	2330	4.0000	5.0000
07 18 59	2330	2340	5.0000	7.0000
07 20 59	1058	1113	6.0000	7.0000
07 26 59	1852	1910	0.0000	0.5000
07 26 59	1910	1913	0.5000	2.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 26 59	1913	1916	2.0000	3.0000
07 26 59	1916	1930	3.0000	7.0000
07 27 59	1905	1910	2.5000	7.0000
07 29 59	0030	0049	5.0000	7.0000
07 29 59	1829	1833	0.0000	0.5000
07 29 59	1833	1845	0.5000	3.0000
07 29 59	1845	1857	3.0000	7.0000
08 03 59	1609	1612	0.5000	1.0000
08 03 59	1612	1621	1.0000	3.0000
08 03 59	1621	1628	3.0000	6.0000
08 03 59	1628	1629	6.0000	7.0000
08 05 59	1648	1656	0.5000	0.2500
08 05 59	1656	1706	0.2500	4.0000
08 05 59	1706	1723	4.0000	7.0000
08 08 59	2015	2035	4.0000	7.0000
08 08 59	2230	2249	5.0000	7.0000
08 17 59	1425	1430	0.5000	1.0000
08 17 59	1430	1439	1.0000	2.0000
08 17 59	1439	1441	2.0000	3.0000
08 17 59	1441	1458	3.0000	7.0000
09 13 59	1506	1512	1.0000	6.0000
09 13 59	1512	1540	6.0000	7.0000
03 23 60	1558	1600	6.0000	7.0000
06 02 60	1812	1828	1.0000	2.0000
06 02 60	1828	1835	2.0000	3.0000
06 02 60	1835	1844	3.0000	4.0000
06 02 60	1844	1858	4.0000	7.0000
06 05 60	1958	2058	4.0000	7.0000
07 03 60	1748	1752	0.2500	0.5000
07 03 60	1752	1758	0.5000	0.2500
07 03 60	1758	1808	0.2500	0.5000
07 03 60	1808	1810	0.5000	2.0000
07 03 60	1810	1817	2.0000	4.0000
07 03 60	1817	1825	4.0000	7.0000
07 16 60	2006	2014	3.0000	0.7500

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 16 60	2014	2020	0.7500	2.0000
07 16 60	2020	2030	2.0000	3.0000
07 16 60	2030	2032	3.0000	4.0000
07 16 60	2032	2058	4.0000	1.5000
07 16 60	2058	2125	1.5000	2.5000
07 16 60	2125	2158	2.5000	4.0000
07 16 60	2158	2214	4.0000	7.0000
07 17 60	1907	1911	1.5000	1.0000
07 17 60	1911	1914	1.0000	0.5000
07 17 60	1914	1922	0.5000	7.0000
07 17 60	1949	1958	0.7500	1.5000
07 17 60	1958	2004	1.5000	3.0000
07 17 60	2004	2030	3.0000	5.0000
07 17 60	2030	2041	5.0000	7.0000
07 22 60	2358	2400	2.0000	2.0000
07 23 60	0000	0007	2.0000	5.0000
07 23 60	0007	0017	5.0000	7.0000
07 30 60	0058	0103	6.0000	1.0000
07 30 60	0103	0123	1.0000	4.0000
07 30 60	0123	0132	4.0000	7.0000
08 07 60	1942	1958	1.0000	4.0000
08 07 60	1958	2007	4.0000	7.0000
08 09 60	1913	1916	1.0000	2.0000
08 09 60	1916	1930	2.0000	0.5000
08 09 60	1930	1940	0.5000	1.0000
08 09 60	1940	1945	1.0000	3.0000
08 09 60	1945	1958	3.0000	7.0000
08 12 60	2058	2124	4.0000	7.0000
08 15 60	1701	1709	0.5000	2.0000
08 15 60	1709	1718	2.0000	1.0000
08 15 60	1718	1728	1.0000	2.0000
08 15 60	1728	1738	2.0000	4.0000
08 15 60	1738	1748	4.0000	7.0000
08 31 60	1704	1711	5.0000	7.0000
09 01 60	1614	1619	4.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
09 09 60	1910	1916	2.0000	4.0000
09 09 60	1916	1935	4.0000	7.0000
11 26 60	2125	2146	2.0000	3.0000
11 26 60	2146	2158	3.0000	3.0000
11 26 60	2158	2213	3.0000	5.0000
11 26 60	2213	2230	5.0000	7.0000
11 26 60	2258	2319	2.0000	2.0000
11 26 60	2319	2346	2.0000	0.5000
11 26 60	2346	2358	0.5000	1.0000
11 26 60	2358	2400	1.0000	1.0000
11 27 60	0000	0028	1.0000	3.0000
11 27 60	0028	0040	3.0000	4.0000
11 27 60	0040	0058	4.0000	5.0000
11 27 60	0058	0130	5.0000	7.0000
02 16 61	1258	1316	5.0000	7.0000
02 16 61	1543	1605	5.0000	7.0000
03 03 61	1058	1122	3.0000	2.0000
03 03 61	1122	1158	2.0000	4.0000
03 03 61	1158	1258	4.0000	6.0000
03 03 61	1258	1358	6.0000	6.0000
03 03 61	1358	1413	6.0000	7.0000
03 15 61	2058	2107	3.0000	1.5000
03 15 61	2107	2125	1.5000	3.0000
03 15 61	2125	2142	3.0000	4.0000
03 15 61	2142	2158	4.0000	4.0000
03 15 61	2158	2210	4.0000	7.0000
04 07 61	1558	1630	5.0000	2.5000
04 07 61	1630	1658	2.5000	2.0000
04 07 61	1658	1700	2.0000	1.0000
04 07 61	1700	1730	1.0000	4.0000
04 07 61	1730	1758	4.0000	6.0000
04 07 61	1758	1820	6.0000	7.0000
05 12 61	1558	1625	5.0000	3.0000
05 12 61	1625	1632	3.0000	1.0000
05 12 61	1632	1758	1.0000	1.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
05 12 61	1758	1804	1.0000	0.2500
05 12 61	1804	1813	0.2500	0.2500
05 12 61	1813	1840	0.2500	1.0000
05 12 61	1840	1858	1.0000	3.0000
05 12 61	1858	1935	3.0000	5.0000
05 12 61	1935	1958	5.0000	5.0000
05 12 61	1958	2030	5.0000	7.0000
06 17 61	1536	1558	0.5000	0.5000
06 17 61	1558	1602	0.5000	1.5000
06 17 61	1602	1607	1.5000	0.5000
06 17 61	1607	1624	0.5000	1.0000
06 17 61	1624	1658	1.0000	1.0000
06 17 61	1658	1705	1.0000	4.0000
06 17 61	1705	1730	4.0000	7.0000
06 17 61	2039	2058	2.0000	3.0000
06 17 61	2058	2158	3.0000	2.0000
06 17 61	2158	2226	2.0000	3.0000
06 17 61	2226	2258	3.0000	3.0000
06 17 61	2258	2350	3.0000	7.0000
06 18 61	1758	1830	6.0000	7.0000
06 25 61	1743	1747	6.0000	7.0000
07 01 61	2258	2314	4.0000	7.0000
07 02 61	1858	1904	0.5000	7.0000
07 14 61	1743	1747	2.0000	0.7500
07 14 61	1747	1750	0.7500	0.2500
07 14 61	1750	1758	0.2500	0.2500
07 14 61	1758	1802	0.2500	3.0000
07 14 61	1802	1815	3.0000	7.0000
07 16 61	2055	2105	2.0000	4.0000
07 16 61	2105	2119	4.0000	7.0000
07 19 61	2215	2230	5.0000	7.0000
07 22 61	1617	1626	0.2500	7.0000
07 22 61	1818	1831	0.0000	0.0000
07 22 61	1831	1858	0.0000	0.5000
07 22 61	1858	1912	0.5000	1.0000



COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 22 61	1912	1918	1.0000	3.0000
07 22 61	1918	1941	3.0000	7.0000
07 27 61	1928	1937	1.5000	4.0000
07 27 61	1937	1953	4.0000	7.0000
07 28 61	1924	1942	0.0000	0.0000
07 28 61	1942	1956	0.0000	0.2500
07 28 61	1956	2000	0.2500	0.5000
07 28 61	2000	2003	0.5000	2.0000
07 28 61	2003	2014	2.0000	4.0000
07 28 61	2014	2026	4.0000	7.0000
08 03 61	2008	2014	3.0000	2.5000
08 03 61	2014	2023	2.5000	3.0000
08 03 61	2023	2058	3.0000	4.0000
08 03 61	2058	2110	4.0000	4.0000
08 03 61	2110	2134	4.0000	7.0000
08 04 61	0658	1058	6.0000	6.0000
08 04 61	1058	1158	6.0000	7.0000
08 04 61	1606	1616	0.0000	0.2500
08 04 61	1616	1619	0.2500	0.5000
08 04 61	1619	1622	0.5000	0.2500
08 04 61	1622	1629	0.2500	4.0000
08 04 61	1629	1636	4.0000	6.0000
08 04 61	1636	1637	6.0000	7.0000
08 08 61	2158	2205	6.0000	7.0000
08 11 61	0108	0158	4.0000	4.0000
08 11 61	0158	0228	4.0000	7.0000
08 14 61	1832	1834	2.0000	7.0000
08 18 61	1922	1928	0.5000	0.0000
08 18 61	1928	1932	0.0000	0.5000
08 18 61	1932	1958	0.5000	0.5000
08 18 61	1958	2003	0.5000	5.0000
08 18 61	2003	2013	5.0000	5.0000
08 18 61	2013	2043	5.0000	7.0000
08 19 61	1958	2008	6.0000	7.0000
08 22 61	2021	2049	4.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 24 61	0658	0758	6.0000	5.0000
08 24 61	0758	0858	5.0000	5.0000
08 24 61	0858	0922	5.0000	7.0000
09 08 61	1932	1958	3.0000	5.0000
09 08 61	1958	2005	5.0000	7.0000
09 11 61	1936	1958	4.0000	6.0000
09 11 61	1958	2025	6.0000	7.0000
10 08 61	1130	1158	6.0000	5.0000
10 08 61	1158	1245	5.0000	7.0000
10 28 61	1358	1458	6.0000	5.0000
10 28 61	1458	1658	5.0000	5.0000
10 28 61	1658	1738	5.0000	7.0000
02 19 62	1848	1858	1.0000	3.0000
02 19 62	1858	1907	3.0000	5.0000
02 19 62	1907	1915	5.0000	7.0000
04 20 62	0635	0658	6.0000	2.0000
04 20 62	0658	0758	2.0000	1.5000
04 20 62	0758	0958	1.5000	1.5000
04 20 62	0958	1017	1.5000	3.0000
04 20 62	1017	1058	3.0000	6.0000
04 20 62	1058	1158	6.0000	6.0000
04 20 62	1158	1205	6.0000	4.0000
04 20 62	1205	1230	4.0000	7.0000
06 26 62	2045	2058	2.0000	4.0000
06 26 62	2058	2145	4.0000	7.0000
07 20 62	2021	2030	3.0000	5.0000
07 20 62	2030	2058	5.0000	7.0000
07 26 62	1716	1722	0.5000	1.0000
07 26 62	1722	1734	1.0000	4.0000
07 26 62	1734	1743	4.0000	7.0000
07 29 62	1842	1858	6.0000	6.0000
07 29 62	1858	1903	6.0000	7.0000
08 01 62	1845	1858	1.0000	0.5000
08 01 62	1858	1910	0.5000	1.0000
08 01 62	1910	1917	1.0000	5.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 01 62	1917	1919	5.0000	7.0000
09 06 62	1203	1215	0.2500	1.0000
09 06 62	1215	1236	1.0000	5.0000
09 06 62	1236	1250	5.0000	7.0000
09 19 62	2221	2235	1.0000	5.0000
09 19 62	2235	2240	5.0000	7.0000
12 11 62	1415	1558	3.0000	3.0000
12 11 62	1558	1615	3.0000	2.0000
12 11 62	1615	1658	2.0000	2.0000
12 11 62	1658	1745	2.0000	4.0000
12 11 62	1745	1858	4.0000	4.0000
12 11 62	1858	1928	4.0000	7.0000
03 15 63	1605	1630	5.0000	7.0000
04 01 63	1830	1840	6.0000	7.0000
04 17 63	1328	1336	3.0000	0.7500
04 17 63	1336	1358	0.7500	0.2500
04 17 63	1358	1411	0.2500	1.0000
04 17 63	1411	1430	1.0000	3.0000
04 17 63	1430	1458	3.0000	5.0000
04 17 63	1458	1520	5.0000	7.0000
06 01 63	2028	2050	4.0000	7.0000
07 02 63	2006	2020	4.0000	7.0000
07 19 63	1903	1909	0.2500	0.5000
07 19 63	1909	1915	0.5000	3.0000
07 19 63	1915	1930	3.0000	5.0000
07 19 63	1930	1949	5.0000	7.0000
07 21 63	1930	1931	6.0000	7.0000
07 27 63	0328	0340	5.0000	7.0000
07 27 63	1958	1959	0.0625	2.0000
07 27 63	1959	2000	2.0000	4.0000
07 27 63	2000	2038	4.0000	7.0000
08 04 63	1720	1726	0.0000	1.0000
08 04 63	1726	1734	1.0000	3.0000
08 04 63	1734	1745	3.0000	1.0000
08 04 63	1745	1758	1.0000	3.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 04 63	1758	1759	3.0000	7.0000
08 05 63	2058	2158	3.0000	3.0000
08 05 63	2158	2230	3.0000	6.0000
08 05 63	2230	2245	6.0000	7.0000
08 13 63	1918	1928	0.5000	0.5000
08 13 63	1928	1935	0.5000	3.0000
08 13 63	1935	1953	3.0000	7.0000
08 13 63	2114	2130	3.0000	5.0000
08 13 63	2130	2141	5.0000	7.0000
08 14 63	1816	1821	0.7500	1.0000
08 14 63	1821	1845	1.0000	1.0000
08 14 63	1845	1858	1.0000	6.0000
08 14 63	1858	1859	6.0000	7.0000
08 19 63	1544	1558	0.5000	0.7500
08 19 63	1558	1602	0.7500	1.0000
08 19 63	1602	1620	1.0000	4.0000
08 19 63	1620	1639	4.0000	7.0000
08 21 63	0758	0828	6.0000	7.0000
08 25 63	2030	2058	6.0000	6.0000
08 25 63	2058	2158	6.0000	0.0625
08 25 63	2158	2202	0.0625	0.0625
08 25 63	2202	2207	0.0625	7.0000
09 09 63	2115	2140	1.0000	1.0000
09 09 63	2140	2158	1.0000	5.0000
09 09 63	2158	2209	5.0000	7.0000
09 10 63	0058	0059	1.5000	0.7500
09 10 63	0059	0110	0.7500	4.0000
09 10 63	0110	0130	4.0000	6.0000
09 10 63	0130	0137	6.0000	7.0000
11 07 63	0437	0450	2.0000	7.0000
02 19 64	2258	2315	6.0000	7.0000
02 29 64	1508	1516	0.2500	0.2500
02 29 64	1516	1520	0.2500	1.0000
02 29 64	1520	1524	1.0000	3.0000
02 29 64	1524	1536	3.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
04 02 64	1625	1630	3.0000	7.0000
05 04 64	2215	2258	6.0000	6.0000
05 04 64	2258	2340	6.0000	7.0000
05 25 64	1258	1330	6.0000	7.0000
05 25 64	1606	1630	6.0000	2.0000
05 25 64	1630	1635	2.0000	3.0000
05 25 64	1635	1658	3.0000	3.0000
05 25 64	1658	1703	3.0000	6.0000
05 25 64	1703	1715	6.0000	7.0000
06 07 64	1358	1440	4.0000	7.0000
06 08 64	0510	0658	6.0000	6.0000
06 08 64	0658	0750	6.0000	7.0000
06 24 64	1722	1725	0.0000	0.5000
06 24 64	1725	1735	0.5000	1.0000
06 24 64	1735	1740	1.0000	0.0000
06 24 64	1740	1758	0.0000	0.5000
06 24 64	1758	1801	0.5000	1.0000
06 24 64	1801	1802	1.0000	2.0000
06 24 64	1802	1810	2.0000	3.0000
06 24 64	1810	1849	3.0000	7.0000
07 12 64	2358	2400	6.0000	6.0000
07 13 64	0000	0013	6.0000	7.0000
07 18 64	2006	2035	5.0000	7.0000
07 23 64	1732	1747	0.0625	3.0000
07 23 64	1747	1758	3.0000	6.0000
07 23 64	1758	1800	6.0000	7.0000
07 24 64	1906	1915	1.5000	3.0000
07 24 64	1915	1958	3.0000	4.0000
07 24 64	1958	2014	4.0000	7.0000
07 29 64	2330	2357	4.0000	4.0000
07 29 64	2357	2400	4.0000	4.0000
07 30 64	0000	0020	4.0000	7.0000
08 04 64	1551	1556	0.2500	1.0000
08 04 64	1556	1603	1.0000	3.0000
08 04 64	1603	1623	3.0000	5.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 04 64	1623	1625	5.0000	7.0000
08 08 64	0230	0255	6.0000	6.0000
08 08 64	0255	0305	6.0000	7.0000
08 08 64	1942	1958	1.5000	5.0000
08 08 64	1958	2004	5.0000	7.0000
08 13 64	1916	1917	5.0000	5.0000
08 13 64	1917	1938	5.0000	7.0000
08 26 64	1540	1549	4.0000	7.0000
08 26 64	1613	1625	4.0000	1.0000
08 26 64	1625	1635	1.0000	1.0000
08 26 64	1635	1638	1.0000	7.0000
09 06 64	1705	1706	1.0000	1.0000
09 06 64	1706	1717	1.0000	4.0000
09 06 64	1717	1725	4.0000	7.0000
01 24 65	1958	2013	6.0000	6.0000
01 24 65	2013	2028	6.0000	7.0000
01 24 65	2125	2140	5.0000	6.0000
01 24 65	2140	2158	6.0000	7.0000
01 25 65	0023	0156	2.0000	2.0000
01 25 65	0156	0210	2.0000	3.0000
01 25 65	0210	0255	3.0000	3.0000
01 25 65	0255	0355	3.0000	6.0000
01 25 65	0355	0430	6.0000	7.0000
02 23 65	0011	0037	3.0000	2.0000
02 23 65	0037	0058	2.0000	1.5000
02 23 65	0058	0158	1.5000	1.5000
02 23 65	0158	0239	1.5000	2.0000
02 23 65	0239	0258	2.0000	2.0000
02 23 65	0258	0316	2.0000	7.0000
03 10 65	1458	1505	6.0000	7.0000
03 15 65	1730	1735	5.0000	7.0000
05 12 65	1055	1117	2.0000	3.0000
05 12 65	1117	1130	3.0000	7.0000
07 08 65	2155	2205	6.0000	7.0000
07 15 65	0137	0158	4.0000	4.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 15 65	0158	0203	4.0000	7.0000
07 23 65	2358	2400	6.0000	6.0000
07 24 65	0000	0002	6.0000	7.0000
08 11 65	2000	2012	0.7500	2.0000
08 11 65	2012	2025	2.0000	3.0000
08 11 65	2025	2058	3.0000	7.0000
08 13 65	2052	2058	1.0000	1.0000
08 13 65	2058	2105	1.0000	2.5000
08 13 65	2105	2115	2.5000	4.0000
08 13 65	2115	2156	4.0000	4.0000
08 13 65	2156	2225	4.0000	7.0000
09 04 65	1743	1758	0.5000	0.5000
09 04 65	1758	1759	0.5000	1.0000
09 04 65	1759	1808	1.0000	7.0000
09 19 65	1635	1638	0.2500	7.0000
03 02 66	1158	1202	1.0000	3.0000
03 02 66	1202	1210	3.0000	7.0000
04 15 66	1931	1941	2.0000	4.0000
04 15 66	1941	1957	4.0000	4.0000
04 15 66	1957	2008	4.0000	7.0000
04 16 66	1812	1825	2.0000	5.0000
04 16 66	1825	1850	5.0000	7.0000
05 19 66	2020	2258	5.0000	5.0000
05 19 66	2258	2320	5.0000	7.0000
05 20 66	2005	2145	5.0000	7.0000
06 19 66	1631	1638	5.0000	2.0000
06 19 66	1638	1658	2.0000	1.5000
06 19 66	1658	1730	1.5000	4.0000
06 19 66	1730	1748	4.0000	7.0000
06 19 66	1825	1958	5.0000	5.0000
06 19 66	1958	2030	5.0000	7.0000
07 24 66	2104	2107	0.5000	2.0000
07 24 66	2107	2124	2.0000	2.0000
07 24 66	2124	2132	2.0000	3.0000
07 24 66	2132	2156	3.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 04 66	2105	2108	3.0000	5.0000
08 04 66	2108	2118	5.0000	7.0000
08 10 66	1956	2009	0.0000	0.2500
08 10 66	2009	2020	0.2500	1.0000
08 10 66	2020	2028	1.0000	1.0000
08 10 66	2028	2038	1.0000	3.0000
08 10 66	2038	2058	3.0000	4.0000
08 10 66	2058	2114	4.0000	7.0000
08 14 66	1709	1712	4.0000	7.0000
08 17 66	1924	1931	5.0000	7.0000
03 24 67	2059	2108	5.0000	3.0000
03 24 67	2108	2115	3.0000	7.0000
04 11 67	1732	1758	2.0000	2.0000
04 11 67	1758	1809	2.0000	6.0000
04 11 67	1809	1845	6.0000	7.0000
05 25 67	1447	1459	0.5000	5.0000
05 25 67	1459	1510	5.0000	7.0000
06 25 67	1930	1939	1.0000	4.0000
06 25 67	1939	1957	4.0000	6.0000
06 25 67	1957	2005	6.0000	7.0000
07 06 67	0128	0158	5.0000	5.0000
07 06 67	0158	0221	5.0000	7.0000
07 10 67	2331	2353	1.0000	4.0000
07 10 67	2353	2359	4.0000	4.0000
07 10 67	2359	2400	4.0000	4.0000
07 11 67	0000	0025	4.0000	1.0000
07 11 67	0025	0038	1.0000	4.0000
07 11 67	0038	0059	4.0000	7.0000
07 21 67	1939	1942	0.5000	0.5000
07 21 67	1942	1955	0.5000	2.0000
07 21 67	1955	2008	2.0000	2.0000
07 21 67	2008	2020	2.0000	7.0000
07 25 67	1922	1927	5.0000	7.0000
07 31 67	1857	1858	3.0000	7.0000
08 14 67	1540	1545	1.0000	0.0000



COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 14 67	1545	1558	0.0000	3.0000
08 14 67	1558	1624	3.0000	7.0000
08 16 67	1824	1831	0.7500	0.5000
08 16 67	1831	1836	0.5000	2.0000
08 16 67	1836	1846	2.0000	5.0000
08 16 67	1846	1847	5.0000	7.0000
08 18 67	2016	2022	2.0000	4.0000
08 18 67	2022	2037	4.0000	7.0000
08 18 67	2108	2132	4.0000	7.0000
08 26 67	2023	2030	6.0000	7.0000
10 03 67	0130	0154	5.0000	3.0000
10 03 67	0154	0158	3.0000	7.0000
11 26 67	2114	2120	2.0000	7.0000
06 07 68	1844	1855	4.0000	2.0000
06 07 68	1855	1859	2.0000	7.0000
07 02 68	2257	2320	5.0000	7.0000
07 03 68	1808	1820	0.0625	0.2500
07 03 68	1820	1838	0.2500	1.5000
07 03 68	1838	1845	1.5000	7.0000
07 04 68	1756	1758	6.0000	7.0000
07 18 68	1900	1901	6.0000	7.0000
07 20 68	2013	2022	0.2500	7.0000
07 21 68	2010	2012	0.5000	0.0000
07 21 68	2012	2015	0.0000	7.0000
07 27 68	1640	1657	0.5000	0.5000
07 27 68	1657	1702	0.5000	2.0000
07 27 68	1702	1706	2.0000	5.0000
07 27 68	1706	1707	5.0000	7.0000
08 03 68	1658	1720	0.0000	0.0000
08 03 68	1720	1727	0.0000	7.0000
08 06 68	1826	1827	3.0000	1.5000
08 06 68	1827	1828	1.5000	1.0000
08 06 68	1828	1843	1.0000	1.5000
08 06 68	1828	1843	1.5000	3.0000
08 06 68	1856	1901	3.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 11 68	1646	1657	0.1250	5.0000
08 11 68	1657	1700	5.0000	7.0000
09 26 68	1740	1753	3.0000	3.0000
09 26 68	1753	1818	3.0000	5.0000
09 26 68	1818	1829	5.0000	7.0000
12 17 68	1545	1615	5.0000	7.0000
02 18 69	1745	1810	6.0000	7.0000
04 10 69	2039	2047	2.0000	5.0000
04 10 69	2047	2058	5.0000	6.0000
04 10 69	2058	2110	6.0000	7.0000
07 03 69	0134	0145	3.0000	2.0000
07 03 69	0145	0156	2.0000	3.0000
07 03 69	0156	0218	3.0000	6.0000
07 03 69	0218	0222	6.0000	7.0000
07 03 69	0610	0656	4.0000	6.0000
07 03 69	0656	0855	6.0000	6.0000
07 03 69	0855	0902	6.0000	7.0000
07 12 69	1929	1933	2.0000	1.0000
07 12 69	1933	1943	1.0000	3.0000
07 12 69	1943	1958	3.0000	5.0000
07 12 69	1958	2039	5.0000	7.0000
08 05 69	2112	2124	2.0000	5.0000
08 05 69	2124	2130	5.0000	7.0000
08 07 69	1930	1944	0.2500	0.2500
08 07 69	1944	1947	0.2500	1.0000
08 07 69	1947	1955	1.0000	7.0000
08 11 69	1932	1955	5.0000	5.0000
08 11 69	1955	2019	5.0000	7.0000
08 16 69	2321	2335	5.0000	7.0000
08 23 69	1604	1608	2.0000	4.0000
08 23 69	1608	1627	4.0000	6.0000
08 23 69	1627	1631	6.0000	7.0000
08 28 69	1905	1917	3.0000	5.0000
08 28 69	1917	1925	5.0000	6.0000
08 28 69	1925	1933	6.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
09 02 69	1716	1732	1.0000	4.0000
09 02 69	1732	1740	4.0000	7.0000
09 11 69	2018	2028	4.0000	7.0000
03 27 70	0040	0135	5.0000	7.0000
04 27 70	1738	1745	5.0000	7.0000
06 04 70	1736	1758	6.0000	6.0000
06 04 70	1758	1830	6.0000	7.0000
06 05 70	1828	1840	1.0000	4.0000
06 05 70	1840	1853	4.0000	7.0000
06 06 70	1821	1845	6.0000	7.0000
06 06 70	1927	1935	0.0000	1.0000
06 06 70	1935	1939	1.0000	2.0000
06 06 70	1939	1959	2.0000	5.0000
06 06 70	1959	2015	5.0000	7.0000
06 28 70	1955	2008	0.5000	1.0000
06 28 70	2008	2023	1.0000	3.0000
06 28 70	2023	2058	3.0000	5.0000
06 28 70	2058	2130	5.0000	7.0000
07 03 70	1723	1730	5.0000	2.0000
07 03 70	1730	1738	2.0000	3.0000
07 03 70	1738	1746	3.0000	7.0000
07 06 70	2131	2147	2.0000	4.0000
07 06 70	2147	2159	4.0000	4.0000
07 06 70	2159	2204	4.0000	6.0000
07 06 70	2204	2255	6.0000	7.0000
07 19 70	1920	1930	5.0000	7.0000
08 01 70	2354	2400	4.0000	4.0000
08 02 70	0000	0058	4.0000	5.0000
08 02 70	0058	0121	5.0000	7.0000
08 02 70	1736	1740	1.0000	0.5000
08 02 70	1740	1755	0.5000	3.0000
08 02 70	1755	1816	3.0000	7.0000
08 08 70	2058	2121	4.0000	7.0000
08 09 70	2142	2155	0.5000	0.7500
08 09 70	2155	2213	0.7500	6.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 09 70	2213	2234	6.0000	7.0000
08 14 70	2016	2023	1.0000	0.5000
08 14 70	2023	2032	0.5000	1.0000
08 14 70	2032	2037	1.0000	2.0000
08 14 70	2037	2055	2.0000	4.0000
08 14 70	2055	2140	4.0000	7.0000
09 03 70	1739	1755	0.2500	1.0000
09 03 70	1755	1822	1.0000	4.0000
09 03 70	1822	1830	4.0000	7.0000
10 01 70	1711	1720	5.0000	7.0000
10 02 70	1346	1359	0.0000	4.0000
10 02 70	1359	1400	4.0000	7.0000
02 03 71	1157	1207	3.0000	1.5000
02 03 71	1207	1229	1.5000	5.0000
02 03 71	1229	1256	5.0000	5.0000
02 03 71	1256	1336	5.0000	1.5000
02 03 71	1336	1458	1.5000	1.5000
02 03 71	1458	1558	1.5000	3.0000
02 03 71	1558	1616	3.0000	1.5000
02 03 71	1616	1655	1.5000	2.0000
02 03 71	1655	1730	2.0000	7.0000
02 16 71	2139	2144	0.5000	6.0000
02 16 71	2144	2153	6.0000	7.0000
03 01 71	1257	1320	6.0000	7.0000
04 14 71	0555	0624	4.0000	2.5000
04 14 71	0624	0655	2.5000	2.0000
04 14 71	0655	0718	2.0000	1.5000
04 14 71	0718	0759	1.5000	1.0000
04 14 71	0759	0859	1.0000	1.5000
04 14 71	0859	0956	1.5000	1.0000
04 14 71	0956	1019	1.0000	0.7500
04 14 71	1019	1024	0.7500	1.0000
04 14 71	1024	1056	1.0000	1.0000
04 14 71	1056	1126	1.0000	1.5000
04 14 71	1126	1155	1.5000	1.5000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
04 14 71	1155	1257	1.5000	3.0000
04 14 71	1257	1320	3.0000	7.0000
04 14 71	1956	2049	6.0000	7.0000
05 12 71	1608	1612	6.0000	0.2500
05 12 71	1612	1641	0.2500	0.2500
05 12 71	1641	1656	0.2500	0.5000
05 12 71	1656	1705	0.5000	1.0000
05 12 71	1705	1712	1.0000	3.0000
05 12 71	1712	1716	3.0000	6.0000
05 12 71	1716	1717	6.0000	7.0000
07 16 71	1839	1849	0.0000	0.2500
07 16 71	1849	1855	0.2500	0.5000
07 16 71	1855	1901	0.5000	1.0000
07 16 71	1901	1912	1.0000	7.0000
07 19 71	2147	2155	6.0000	6.0000
07 19 71	2155	2203	6.0000	0.5000
07 19 71	2203	2206	0.5000	1.0000
07 19 71	2206	2212	1.0000	7.0000
07 27 71	1928	1947	1.0000	0.7500
07 27 71	1947	1958	0.7500	1.0000
07 27 71	1958	2012	1.0000	2.0000
07 27 71	2012	2018	2.0000	5.0000
07 27 71	2018	2026	5.0000	7.0000
07 31 71	0055	0104	0.0000	0.0625
07 31 71	0104	0111	0.0625	0.3750
07 31 71	0111	0113	0.3750	0.5000
07 31 71	0113	0122	0.5000	1.5000
07 31 71	0122	0140	1.5000	1.0000
07 31 71	0140	0157	1.0000	4.0000
07 31 71	0157	0222	4.0000	7.0000
08 01 71	0457	0502	5.0000	7.0000
08 02 71	0123	0130	5.0000	2.5000
08 02 71	0130	0156	2.5000	2.5000
08 02 71	0156	0216	2.5000	5.0000
08 02 71	0216	0227	5.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 02 71	0330	0355	0.7500	0.7500
08 02 71	0355	0412	0.7500	4.0000
08 02 71	0412	0434	4.0000	7.0000
08 03 71	0455	0519	5.0000	7.0000
08 03 71	2013	2055	3.0000	7.0000
08 09 71	2255	2333	1.0000	1.2500
08 09 71	2333	2355	1.2500	4.0000
08 09 71	2355	2400	4.0000	4.0000
08 10 71	0000	0055	4.0000	4.0000
08 10 71	0055	0122	4.0000	7.0000
08 10 71	1922	1925	0.2500	1.0000
08 10 71	1925	1936	1.0000	7.0000
08 12 71	2313	2323	0.0000	2.0000
08 12 71	2323	2333	2.0000	5.0000
08 12 71	2333	2356	5.0000	7.0000
08 14 71	2325	2328	1.5000	0.2500
08 14 71	2328	2332	0.2500	0.2500
08 14 71	2332	2343	0.2500	1.0000
08 14 71	2343	2355	1.0000	7.0000
08 17 71	1810	1817	1.0000	5.0000
08 17 71	1817	1820	5.0000	7.0000
08 19 71	2021	2056	5.0000	7.0000
08 30 71	1806	1816	0.2500	7.0000
09 01 71	1818	1821	0.2500	0.0000
09 01 71	1821	1830	0.0000	0.3750
09 01 71	1830	1855	0.3750	1.0000
09 01 71	1855	1900	1.0000	4.0000
09 01 71	1900	1920	4.0000	7.0000
09 08 71	2117	2122	4.0000	2.0000
09 08 71	2122	2134	2.0000	4.0000
09 08 71	2134	2157	4.0000	7.0000
09 22 71	1530	1557	0.7500	4.0000
09 22 71	1557	1601	4.0000	7.0000
10 07 71	2140	2215	6.0000	7.0000
10 24 71	1310	1330	5.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
04 11 72	1830	1855	3.0000	3.0000
04 11 72	1855	1905	3.0000	7.0000
04 13 72	1148	1155	4.0000	6.0000
04 13 72	1155	1230	6.0000	6.0000
04 13 72	1230	1255	6.0000	5.0000
04 13 72	1255	1329	5.0000	2.0000
04 13 72	1329	1340	2.0000	1.0000
04 13 72	1340	1355	1.0000	3.0000
04 13 72	1355	1400	3.0000	1.0000
04 13 72	1400	1420	1.0000	3.0000
04 13 72	1420	1435	3.0000	2.0000
04 13 72	1435	1455	2.0000	1.0000
04 13 72	1455	1502	1.0000	0.7500
04 13 72	1502	1531	0.7500	1.0000
04 13 72	1531	1555	1.0000	1.5000
04 13 72	1555	1607	1.5000	3.0000
04 13 72	1607	1655	3.0000	3.0000
04 13 72	1655	1756	3.0000	1.0000
04 13 72	1756	1828	1.0000	3.0000
04 13 72	1828	1856	3.0000	4.0000
04 13 72	1856	1950	4.0000	7.0000
04 18 72	2243	2248	4.0000	3.0000
04 18 72	2248	2256	3.0000	4.0000
04 18 72	2256	2320	4.0000	6.0000
04 18 72	2320	2355	6.0000	5.0000
04 18 72	2355	2400	5.0000	5.0000
04 19 72	0000	0055	5.0000	5.0000
04 19 72	0055	0140	5.0000	7.0000
05 28 72	2338	2356	1.5000	1.7500
05 28 72	2356	2400	1.7500	1.7500
05 29 72	0000	0003	1.7500	3.0000
05 29 72	0003	0045	3.0000	5.0000
05 29 72	0045	0055	5.0000	6.0000
05 29 72	0055	0156	6.0000	7.0000
05 29 72	1833	1856	0.0000	0.5000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
05 29 72	1856	1919	0.5000	0.7500
05 29 72	1919	1928	0.7500	1.5000
05 29 72	1928	1935	1.5000	1.5000
05 29 72	1935	1956	1.5000	5.0000
05 29 72	1956	2020	5.0000	7.0000
05 30 72	1825	1833	1.0000	1.0000
05 30 72	1833	1841	1.0000	2.0000
05 30 72	1841	1845	2.0000	3.0000
05 30 72	1845	1849	3.0000	7.0000
06 03 72	2032	2055	5.0000	5.0000
06 03 72	2055	2120	5.0000	7.0000
06 13 72	1948	1958	0.0000	3.0000
06 13 72	1958	2005	3.0000	7.0000
07 08 72	1955	2015	3.0000	7.0000
07 16 72	0143	0155	1.5000	2.5000
07 16 72	0155	0226	2.5000	7.0000
07 16 72	2208	2221	2.0000	4.0000
07 16 72	2221	2230	4.0000	7.0000
07 17 72	0038	0055	4.0000	7.0000
07 23 72	1835	1855	0.8750	5.0000
07 23 72	1855	1908	5.0000	7.0000
07 28 72	2230	2235	3.0000	1.0000
07 28 72	2235	2257	1.0000	0.7500
07 28 72	2257	2308	0.7500	2.5000
07 28 72	2308	2324	2.5000	4.0000
07 28 72	2324	2333	4.0000	7.0000
07 29 72	2006	2018	0.6250	0.8750
07 29 72	2018	2024	0.8750	4.0000
07 29 72	2024	2057	4.0000	7.0000
07 30 72	0056	0256	6.0000	6.0000
07 30 72	0256	0356	6.0000	7.0000
07 30 72	0555	0656	5.0000	7.0000
07 30 72	0956	1055	5.0000	4.0000
07 30 72	1055	1156	4.0000	5.0000
07 30 72	1156	1356	5.0000	5.0000



COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 30 72	1356	1455	5.0000	6.0000
07 30 72	1455	1525	6.0000	7.0000
08 04 72	2024	2030	2.0000	2.0000
08 04 72	2030	2047	2.0000	4.0000
08 04 72	2047	2056	4.0000	6.0000
08 04 72	2056	2059	6.0000	7.0000
08 05 72	0056	0103	6.0000	7.0000
08 05 72	2049	2056	0.1250	0.0000
08 05 72	2056	2106	0.0000	0.0000
08 05 72	2106	2112	0.0000	7.0000
08 07 72	1733	1743	5.0000	2.0000
08 07 72	1743	1749	2.0000	1.0000
08 07 72	1749	1755	1.0000	0.5000
08 07 72	1755	1816	0.5000	0.7500
08 07 72	1816	1826	0.7500	0.5000
08 07 72	1826	1830	0.5000	0.1250
08 07 72	1830	1841	0.1250	0.7500
08 07 72	1841	1845	0.7500	1.0000
08 07 72	1845	1847	1.0000	2.0000
08 07 72	1847	1855	2.0000	3.0000
08 07 72	1855	1900	3.0000	7.0000
08 08 72	1815	1820	4.0000	7.0000
08 08 72	2055	2110	6.0000	7.0000
08 12 72	2000	2014	0.2500	0.7500
08 12 72	2014	2022	0.7500	0.7500
08 12 72	2022	2035	0.7500	7.0000
08 28 72	1837	1847	1.0000	3.0000
08 28 72	1847	1855	3.0000	3.0000
08 28 72	1855	1903	3.0000	7.0000
08 31 72	1935	1939	3.0000	7.0000
09 01 72	2132	2137	1.0000	3.0000
09 01 72	2137	2147	3.0000	4.0000
09 01 72	2147	2155	4.0000	4.0000
09 01 72	2155	2215	4.0000	7.0000
09 02 72	2205	2305	6.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
09 07 72	2256	2303	6.0000	7.0000
09 09 72	2105	2130	5.0000	7.0000
09 17 72	2221	2255	3.0000	5.0000
09 17 72	2255	2335	5.0000	7.0000
09 18 72	1700	1717	0.5000	7.0000
09 18 72	1830	1848	4.0000	7.0000
10 03 72	0905	0915	6.0000	7.0000
04 01 73	1747	1757	5.0000	5.0000
04 01 73	1757	1855	5.0000	7.0000
06 02 73	1647	1656	5.0000	6.0000
06 02 73	1656	1740	6.0000	7.0000
06 13 73	1048	1105	4.0000	7.0000
07 08 73	1943	1955	1.5000	2.0000
07 08 73	1955	2015	2.0000	5.0000
07 08 73	2015	2024	5.0000	7.0000
07 27 73	1740	1747	2.0000	5.0000
07 27 73	1747	1753	5.0000	7.0000
07 27 73	1940	1955	4.0000	5.0000
07 27 73	1955	2007	5.0000	7.0000
08 19 73	1708	1712	1.0000	3.0000
08 19 73	1712	1724	3.0000	2.0000
08 19 73	1724	1733	2.0000	5.0000
08 19 73	1733	1736	5.0000	7.0000
08 19 73	2047	2056	3.0000	4.0000
08 19 73	2056	2105	4.0000	7.0000
08 29 73	1955	2002	6.0000	7.0000
08 30 73	1755	1758	5.0000	7.0000
10 29 73	2115	2140	3.0000	7.0000
11 18 73	1839	1846	1.0000	3.0000
11 18 73	1846	1858	3.0000	5.0000
11 18 73	1858	1900	5.0000	7.0000
01 01 74	1615	1715	5.0000	7.0000
02 19 74	2140	2255	4.0000	5.0000
02 19 74	2255	2356	5.0000	5.0000
02 19 74	2356	2400	5.0000	5.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
02 20 74	0000	0050	5.0000	7.0000
04 09 74	1610	1745	6.0000	7.0000
07 05 74	2124	2127	6.0000	7.0000
07 13 74	1830	1835	0.5000	0.7500
07 13 74	1835	1841	0.7500	2.0000
07 13 74	1841	1855	2.0000	4.0000
07 13 74	1855	1903	4.0000	7.0000
07 22 74	1959	2055	5.0000	7.0000
07 31 74	1837	1855	1.5000	2.0000
07 31 74	1855	1915	2.0000	6.0000
07 31 74	1915	1925	6.0000	1.0000
07 31 74	1925	1935	1.0000	4.0000
07 31 74	1935	1955	4.0000	6.0000
07 31 74	1955	2055	6.0000	7.0000
08 03 74	1732	1737	1.0000	3.0000
08 03 74	1737	1744	3.0000	7.0000
08 23 74	1836	1841	0.5000	2.0000
08 23 74	1841	1855	2.0000	6.0000
08 23 74	1855	1857	6.0000	7.0000
08 23 74	1923	1937	3.0000	7.0000
08 24 74	1827	1830	6.0000	7.0000
09 03 74	1730	1745	4.0000	2.0000
09 03 74	1745	1757	2.0000	6.0000
09 03 74	1757	1812	6.0000	7.0000
09 13 74	1457	1505	0.2500	0.7500
09 13 74	1505	1520	0.7500	1.3750
09 13 74	1520	1542	1.3750	3.0000
09 13 74	1542	1555	3.0000	1.0000
09 13 74	1555	1557	1.0000	7.0000
09 20 74	1731	1741	0.7500	3.0000
09 20 74	1741	1750	3.0000	7.0000
09 26 74	1754	1808	6.0000	7.0000
01 28 75	0244	0315	6.0000	7.0000
03 05 75	2005	2020	5.0000	7.0000
03 08 75	1855	1908	1.0000	2.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
03 08 75	1908	1911	2.0000	3.0000
03 08 75	1911	1935	3.0000	6.0000
03 08 75	1935	1937	6.0000	7.0000
03 26 75	2330	2400	5.0000	5.0000
03 27 75	0000	0030	5.0000	7.0000
05 20 75	1416	1555	6.0000	6.0000
05 20 75	1555	1630	6.0000	7.0000
05 20 75	2045	2256	5.0000	5.0000
05 20 75	2256	2355	5.0000	6.0000
05 20 75	2355	2400	6.0000	6.0000
05 21 75	0000	0045	6.0000	7.0000
06 18 75	0835	0956	4.0000	5.0000
06 18 75	0956	1020	5.0000	7.0000
07 04 75	0416	0423	4.0000	7.0000
07 06 75	1929	1957	1.0000	4.0000
07 06 75	1957	2005	4.0000	7.0000
07 07 75	2125	2155	5.0000	7.0000
07 12 75	1756	1800	6.0000	7.0000
07 13 75	1655	1703	4.0000	2.0000
07 13 75	1703	1707	2.0000	4.0000
07 13 75	1707	1717	4.0000	7.0000
07 16 75	1528	1545	6.0000	7.0000
07 24 75	1956	2006	5.0000	7.0000
07 24 75	2055	2120	5.0000	7.0000
07 25 75	1722	1728	1.5000	7.0000
07 26 75	1844	1856	3.0000	5.0000
07 26 75	1856	1859	5.0000	7.0000
08 06 75	1805	1816	3.0000	5.0000
08 06 75	1816	1827	5.0000	7.0000
08 08 75	1728	1737	0.5000	0.2500
08 08 75	1737	1741	0.2500	0.5000
08 08 75	1741	1750	0.5000	2.0000
08 08 75	1750	1756	2.0000	3.0000
08 08 75	1756	1759	3.0000	7.0000
08 10 75	1959	2006	0.5000	0.7500

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 10 75	2006	2017	0.7500	4.0000
08 10 75	2017	2037	4.0000	7.0000
08 26 75	1842	1847	5.0000	7.0000
09 01 75	2135	2155	5.0000	5.0000
09 01 75	2155	2215	5.0000	7.0000
09 04 75	1606	1612	0.1250	0.2500
09 04 75	1612	1616	0.2500	0.7500
09 04 75	1616	1624	0.7500	2.0000
09 04 75	1624	1630	2.0000	7.0000
09 05 75	1655	1700	4.0000	2.0000
09 05 75	1700	1703	2.0000	7.0000
10 19 75	1426	1433	4.0000	7.0000
10 23 75	0540	0627	4.0000	2.0000
10 23 75	0627	0655	2.0000	2.0000
10 23 75	0655	0747	2.0000	1.5000
10 23 75	0747	0756	1.5000	1.5000
10 23 75	0756	0824	1.5000	2.5000
10 23 75	0824	0831	2.5000	3.0000
10 23 75	0831	0856	3.0000	3.0000
10 23 75	0856	0915	3.0000	5.0000
10 23 75	0915	0940	5.0000	7.0000
11 28 75	0430	0456	2.0000	1.5000
11 28 75	0456	0539	1.5000	3.0000
11 28 75	0539	0555	3.0000	4.0000
11 28 75	0555	0637	4.0000	7.0000
05 17 76	1955	2012	2.0000	5.0000
05 17 76	2012	2030	5.0000	7.0000
06 28 76	1815	1825	1.5000	3.0000
06 28 76	1825	1835	3.0000	7.0000
06 29 76	0240	0345	6.0000	7.0000
06 29 76	1820	1838	4.0000	7.0000
07 07 76	0255	0304	4.0000	7.0000
07 16 76	1937	1944	5.0000	7.0000
07 24 76	1958	2016	3.0000	7.0000
07 28 76	2233	2241	6.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 08 76	1655	1707	0.1250	0.7500
08 08 76	1707	1714	0.7500	1.0000
08 08 76	1714	1720	1.0000	4.0000
08 08 76	1720	1747	4.0000	7.0000
08 10 76	2020	2029	6.0000	7.0000
08 22 76	2014	2022	1.2500	3.0000
08 22 76	2022	2032	3.0000	7.0000
08 28 76	1921	1928	1.0000	1.0000
08 28 76	1928	1955	1.0000	7.0000
08 29 76	1655	1659	2.5000	7.0000
09 01 76	1655	1709	4.0000	6.0000
09 01 76	1709	1720	6.0000	7.0000
09 04 76	1856	1918	1.5000	3.0000
09 04 76	1918	1933	3.0000	5.0000
09 04 76	1933	1948	5.0000	7.0000
09 04 76	2024	2033	3.0000	2.5000
09 04 76	2033	2055	2.5000	2.5000
09 04 76	2055	2136	2.5000	3.0000
09 04 76	2136	2156	3.0000	5.0000
09 04 76	2156	2208	5.0000	7.0000
09 23 76	1550	1602	3.0000	7.0000
10 13 76	1635	1643	0.1250	0.5000
10 13 76	1643	1649	0.5000	2.0000
10 13 76	1649	1655	2.0000	4.0000
10 13 76	1655	1715	4.0000	7.0000
02 22 77	1030	1109	4.0000	1.0000
02 22 77	1109	1125	1.0000	1.0000
02 22 77	1125	1140	1.0000	0.7500
02 22 77	1140	1155	0.7500	1.0000
02 22 77	1155	1255	1.0000	2.5000
02 22 77	1255	1302	2.5000	7.0000
02 24 77	1620	1628	2.0000	7.0000
03 10 77	0230	0340	6.0000	7.0000
03 10 77	2210	2355	6.0000	5.0000
03 10 77	2355	2400	5.0000	5.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
03 11 77	0000	0156	5.0000	5.0000
03 11 77	0156	0256	5.0000	6.0000
03 11 77	0256	0355	6.0000	5.0000
03 11 77	0355	0455	5.0000	6.0000
03 11 77	0455	0655	6.0000	6.0000
03 11 77	0655	0730	6.0000	7.0000
04 15 77	1512	1555	5.0000	5.0000
04 15 77	1555	1635	5.0000	7.0000
05 09 77	1430	1441	6.0000	7.0000
06 02 77	1955	2001	4.0000	1.0000
06 02 77	2001	2013	1.0000	1.5000
06 02 77	2013	2027	1.5000	4.0000
06 02 77	2027	2050	4.0000	7.0000
06 05 77	1749	1755	0.5000	0.8750
06 05 77	1755	1759	0.8750	0.2500
06 05 77	1759	1802	0.2500	0.5000
06 05 77	1802	1805	0.5000	1.0000
06 05 77	1805	1821	1.0000	3.0000
06 05 77	1821	1823	3.0000	7.0000
06 07 77	1825	1845	6.0000	7.0000
06 08 77	1607	1610	1.0000	7.0000
07 10 77	2015	2024	0.1250	0.5000
07 10 77	2024	2030	0.5000	1.0000
07 10 77	2030	2043	1.0000	1.5000
07 10 77	2043	2048	1.5000	4.0000
07 10 77	2048	2109	4.0000	7.0000
07 17 77	1818	1821	6.0000	7.0000
07 17 77	2211	2226	2.0000	4.0000
07 17 77	2226	2255	4.0000	6.0000
07 17 77	2255	2302	6.0000	7.0000
07 18 77	0055	0107	5.0000	7.0000
07 25 77	1923	1942	0.5000	3.0000
07 25 77	1942	1955	3.0000	6.0000
07 25 77	1955	2000	6.0000	7.0000
07 26 77	1832	1839	0.2500	0.5000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 26 77	1839	1855	0.5000	3.0000
07 26 77	1855	1904	3.0000	7.0000
07 28 77	2018	2042	6.0000	2.5000
07 28 77	2042	2056	2.5000	3.0000
07 28 77	2056	2130	3.0000	7.0000
07 31 77	2245	2256	3.0000	3.0000
07 31 77	2256	2355	3.0000	4.0000
07 31 77	2355	2400	4.0000	4.0000
08 01 77	0000	0055	4.0000	6.0000
08 01 77	0055	0102	6.0000	7.0000
08 06 77	1711	1713	6.0000	7.0000
08 09 77	2055	2155	3.0000	6.0000
08 09 77	2155	2202	6.0000	7.0000
08 12 77	1720	1724	2.0000	4.0000
08 12 77	1724	1755	4.0000	7.0000
08 12 77	1838	1855	6.0000	7.0000
08 13 77	1938	1956	4.0000	7.0000
09 05 77	2210	2230	6.0000	7.0000
09 09 77	2238	2256	0.2500	6.0000
09 09 77	2256	2310	6.0000	7.0000
12 16 77	0230	0655	5.0000	5.0000
12 16 77	0655	0740	5.0000	7.0000
12 16 77	1030	1120	6.0000	7.0000
05 01 78	1602	1619	1.0000	3.0000
05 01 78	1619	1625	3.0000	7.0000
06 05 78	1903	1935	3.0000	0.2500
06 05 78	1935	1942	0.2500	0.5000
06 05 78	1942	1955	0.5000	7.0000
06 27 78	1742	1750	5.0000	7.0000
06 27 78	1755	1830	5.0000	5.0000
06 27 78	1830	1845	5.0000	7.0000
07 08 78	2233	2256	3.0000	5.0000
07 08 78	2256	2356	5.0000	7.0000
07 09 78	2239	2255	6.0000	4.0000
07 09 78	2255	2314	4.0000	7.0000



COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 17 78	2144	2200	5.0000	2.5000
07 17 78	2200	2213	2.5000	5.0000
07 17 78	2213	2257	5.0000	5.0000
07 17 78	2257	2314	5.0000	7.0000
07 22 78	2014	2032	2.0000	4.0000
07 22 78	2032	2055	4.0000	7.0000
07 29 78	2043	2057	1.5000	7.0000
07 30 78	2132	2155	5.0000	6.0000
07 30 78	2155	2202	6.0000	7.0000
08 01 78	2243	2256	2.0000	7.0000
08 02 78	2224	2233	0.5000	5.0000
08 02 78	2233	2242	5.0000	7.0000
08 03 78	2254	2309	4.0000	4.0000
08 03 78	2309	2355	4.0000	7.0000
08 06 78	2037	2050	1.0000	7.0000
10 19 78	1801	1804	6.0000	6.0000
10 19 78	1804	1806	6.0000	3.0000
10 19 78	1806	1830	3.0000	7.0000
10 23 78	1055	1153	6.0000	6.0000
10 23 78	1153	1230	6.0000	7.0000
03 17 79	1614	1629	1.0000	3.0000
03 17 79	1629	1640	3.0000	7.0000
05 18 79	2214	2258	4.0000	4.0000
05 18 79	2258	2305	4.0000	7.0000
05 19 79	1801	1819	0.2500	0.7500
05 19 79	1819	1831	0.7500	3.0000
05 19 79	1831	1839	3.0000	5.0000
05 19 79	1839	1856	5.0000	6.0000
05 19 79	1856	1904	6.0000	7.0000
06 29 79	2105	2125	4.0000	7.0000
07 16 79	2126	2130	3.0000	7.0000
07 17 79	1853	1922	1.0000	7.0000
07 28 79	2043	2055	4.0000	6.0000
07 28 79	2055	2059	6.0000	7.0000
07 29 79	1919	1933	5.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 04 79	2026	2055	3.0000	7.0000
08 14 79	1811	1826	3.0000	7.0000
08 15 79	1839	1850	1.0000	7.0000
09 14 79	1634	1636	1.0000	0.5000
09 14 79	1636	1648	0.5000	1.0000
09 14 79	1648	1653	1.0000	1.0000
09 14 79	1653	1702	1.0000	3.0000
09 14 79	1702	1715	3.0000	7.0000
03 06 80	1742	1752	2.0000	5.0000
03 06 80	1752	1806	5.0000	7.0000
04 01 80	1345	1359	6.0000	0.7500
04 01 80	1359	1408	0.7500	5.0000
04 01 80	1408	1410	5.0000	7.0000
04 28 80	1648	1740	3.0000	7.0000
05 05 80	1819	1831	4.0000	7.0000
06 29 80	1908	1935	1.0000	2.5000
06 29 80	1935	1953	2.5000	2.7500
06 29 80	1953	2038	2.7500	5.0000
06 29 80	2038	2051	5.0000	5.0000
06 29 80	2051	2103	5.0000	7.0000
07 11 80	2153	2202	4.0000	7.0000
07 19 80	1827	1835	5.0000	0.7500
07 19 80	1835	1840	0.7500	1.5000
07 19 80	1840	1851	1.5000	1.5000
07 19 80	1851	1906	1.5000	4.0000
07 19 80	1906	1913	4.0000	1.0000
07 19 80	1913	1927	1.0000	4.0000
07 19 80	1927	1952	4.0000	7.0000
07 21 80	1841	1855	0.5000	0.5000
07 21 80	1855	1910	0.5000	3.0000
07 21 80	1910	1933	3.0000	7.0000
07 23 80	1930	1937	0.2500	5.0000
07 23 80	1937	1948	5.0000	7.0000
07 25 80	2216	2225	4.0000	4.0000
07 25 80	2225	2236	4.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 31 80	2106	2108	5.0000	7.0000
08 09 80	2123	2155	4.0000	7.0000
08 10 80	1823	1829	0.7500	7.0000
08 13 80	2152	2200	3.0000	7.0000
09 04 80	1905	1919	0.5000	3.0000
09 04 80	1919	1931	3.0000	0.7500
09 04 80	1931	1935	0.7500	5.0000
09 04 80	1935	1936	5.0000	7.0000
09 25 80	2020	2050	4.0000	7.0000
10 12 80	1638	1650	5.0000	7.0000
10 14 80	1609	1639	3.0000	6.0000
10 14 80	1639	1650	6.0000	7.0000
10 14 80	2245	2330	6.0000	7.0000
03 13 81	2312	2330	6.0000	7.0000
03 26 81	1727	1735	2.5000	4.0000
03 26 81	1735	1750	4.0000	4.0000
03 26 81	1750	1835	4.0000	7.0000
03 26 81	2046	2103	6.0000	7.0000
03 27 81	1801	1835	6.0000	7.0000
04 02 81	1453	1554	5.0000	5.0000
04 02 81	1554	1637	5.0000	2.0000
04 02 81	1637	1639	2.0000	0.5000
04 02 81	1639	1653	0.5000	0.5000
04 02 81	1653	1702	0.5000	6.0000
04 02 81	1702	1740	6.0000	7.0000
04 18 81	2053	2058	5.0000	7.0000
04 29 81	1715	1750	5.0000	7.0000
04 30 81	2101	2123	0.7500	1.5000
04 30 81	2123	2130	1.5000	3.0000
04 30 81	2130	2140	3.0000	7.0000
05 01 81	1608	1621	1.0000	0.5000
05 01 81	1621	1632	0.5000	1.0000
05 01 81	1632	1640	1.0000	2.0000
05 01 81	1640	1652	2.0000	6.0000
05 01 81	1652	1705	6.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
06 25 81	1833	1842	1.5000	4.0000
06 25 81	1842	1853	4.0000	4.0000
06 25 81	1853	1900	4.0000	7.0000
07 01 81	1626	1635	1.1250	0.5000
07 01 81	1635	1655	0.5000	4.0000
07 01 81	1655	1659	4.0000	7.0000
07 07 81	2144	2155	1.5000	5.0000
07 07 81	2155	2252	5.0000	3.0000
07 07 81	2252	2312	3.0000	7.0000
07 12 81	1803	1819	2.0000	5.0000
07 12 81	1819	1823	5.0000	7.0000
07 14 81	1729	1740	1.0000	1.5000
07 14 81	1740	1744	1.5000	3.0000
07 14 81	1744	1750	3.0000	5.0000
07 14 81	1750	1755	5.0000	7.0000
07 15 81	2208	2213	5.0000	2.0000
07 15 81	2213	2219	2.0000	5.0000
07 15 81	2219	2252	5.0000	7.0000
07 22 81	0002	0008	0.5000	1.5000
07 22 81	0008	0019	1.5000	5.0000
07 22 81	0019	0054	5.0000	5.0000
07 22 81	0054	0138	5.0000	7.0000
08 07 81	2223	2227	2.0000	0.5000
08 07 81	2227	2233	0.5000	2.0000
08 07 81	2233	2237	2.0000	4.0000
08 07 81	2237	2252	4.0000	4.0000
08 07 81	2252	2352	4.0000	3.0000
08 07 81	2352	2400	3.0000	3.0000
08 08 81	0000	0012	3.0000	7.0000
08 08 81	1855	1908	3.0000	7.0000
08 10 81	1557	1605	2.0000	1.5000
08 10 81	1605	1612	1.5000	2.0000
08 10 81	1612	1618	2.0000	4.0000
08 10 81	1618	1642	4.0000	7.0000
08 24 81	2024	2032	2.0000	3.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 24 81	2032	2053	3.0000	6.0000
08 24 81	2053	2059	6.0000	7.0000
08 30 81	1910	1924	1.5000	2.0000
08 30 81	1924	1934	2.0000	3.0000
08 30 81	1934	1952	3.0000	4.0000
08 30 81	1952	2052	4.0000	6.0000
08 30 81	2052	2059	6.0000	7.0000
09 05 81	1550	1603	2.0000	1.0000
09 05 81	1603	1620	1.0000	1.5000
09 05 81	1620	1626	1.5000	3.0000
09 05 81	1626	1645	3.0000	7.0000
11 25 81	1150	1217	6.0000	4.0000
11 25 81	1217	1234	4.0000	2.0000
11 25 81	1234	1239	2.0000	4.0000
11 25 81	1239	1250	4.0000	4.0000
11 25 81	1250	1351	4.0000	6.0000
11 25 81	1351	1450	6.0000	5.0000
11 25 81	1450	1536	5.0000	7.0000
12 21 81	1540	1606	3.0000	7.0000
02 17 82	2055	2122	5.0000	7.0000
05 01 82	1656	1714	2.0000	3.0000
05 01 82	1714	1720	3.0000	7.0000
07 22 82	1942	1955	0.1875	1.0000
07 22 82	1955	2009	1.0000	3.0000
07 22 82	2009	2033	3.0000	7.0000
07 23 82	1724	1729	1.0000	2.2500
07 23 82	1729	1752	2.2500	6.0000
07 23 82	1752	1755	6.0000	7.0000
08 20 82	2050	2057	6.0000	7.0000
08 23 82	1826	1837	5.0000	6.0000
08 23 82	1837	1854	6.0000	7.0000
08 24 82	2206	2212	5.0000	7.0000
09 07 82	1711	1717	1.0000	0.5000
09 07 82	1717	1734	0.5000	1.0000
09 07 82	1734	1744	1.0000	3.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
09 07 82	1744	1749	3.0000	4.0000
09 07 82	1749	1820	4.0000	7.0000
11 30 82	1440	1528	6.0000	2.5000
11 30 82	1528	1549	2.5000	2.5000
11 30 82	1549	1649	2.5000	2.2500
11 30 82	1649	1710	2.2500	7.0000
01 27 83	1451	1502	5.0000	7.0000
05 28 83	2345	2400	4.0000	4.0000
05 29 83	0000	0050	4.0000	6.0000
05 29 83	0050	0249	6.0000	6.0000
05 29 83	0249	0354	6.0000	7.0000
07 05 83	2011	2022	6.0000	2.0000
07 05 83	2022	2038	2.0000	6.0000
07 05 83	2038	2058	6.0000	6.0000
07 05 83	2058	2113	6.0000	7.0000
07 07 83	1707	1742	1.0000	7.0000
07 10 83	2149	2156	4.0000	7.0000
07 27 83	1919	1931	2.5000	2.0000
07 27 83	1931	1945	2.0000	3.0000
07 27 83	1945	1956	3.0000	7.0000
07 31 83	1848	1856	2.0000	5.0000
07 31 83	1856	1903	5.0000	7.0000
08 01 83	1953	2011	3.0000	2.0000
08 01 83	2011	2023	2.0000	5.0000
08 01 83	2023	2027	5.0000	7.0000
08 07 83	2015	2028	2.0000	7.0000
08 08 83	2028	2033	5.0000	7.0000
08 13 83	1827	1834	0.7500	0.1250
08 13 83	1834	1844	0.1250	0.5000
08 13 83	1844	1857	0.5000	0.5000
08 13 83	1857	1916	0.5000	0.3750
08 13 83	1916	1925	0.3750	7.0000
08 16 83	1612	1615	0.2500	7.0000
08 31 83	1838	1844	1.5000	0.2500
08 31 83	1844	1852	0.2500	1.5000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 31 83	1852	1855	1.5000	1.5000
08 31 83	1855	1908	1.5000	4.0000
08 31 83	1908	1923	4.0000	7.0000
09 06 83	1855	1907	0.5000	1.0000
09 06 83	1907	1915	1.0000	2.0000
09 06 83	1915	1928	2.0000	4.0000
09 06 83	1928	1951	4.0000	6.0000
09 06 83	1951	1953	6.0000	7.0000
09 22 83	1841	1845	0.1875	0.2500
09 22 83	1845	1917	0.2500	1.0000
09 22 83	1917	1926	1.0000	4.0000
09 22 83	1926	1951	4.0000	6.0000
09 22 83	1951	1955	6.0000	7.0000
09 28 83	1436	1452	1.5000	2.0000
09 28 83	1452	1504	2.0000	4.0000
09 28 83	1504	1508	4.0000	7.0000
02 16 84	2245	2350	4.0000	5.0000
02 16 84	2350	2400	5.0000	5.0000
02 17 84	0000	0050	5.0000	6.0000
02 17 84	0050	0120	6.0000	7.0000
03 26 84	1648	1750	5.0000	5.0000
03 26 84	1750	1831	5.0000	7.0000
03 27 84	0147	0230	6.0000	7.0000
04 19 84	1852	1915	6.0000	7.0000
04 26 84	0852	0930	6.0000	7.0000
05 14 84	1835	1843	2.0000	1.0000
05 14 84	1843	1855	1.0000	1.0000
05 14 84	1855	1900	1.0000	7.0000
05 29 84	1755	1810	2.0000	7.0000
05 30 84	1548	1615	1.0000	6.0000
05 30 84	1615	1625	6.0000	7.0000
05 30 84	2046	2058	5.0000	7.0000
06 28 84	2013	2024	1.5000	1.0000
06 28 84	2024	2027	1.0000	4.0000
06 28 84	2027	2041	4.0000	6.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
06 28 84	2041	2049	6.0000	6.0000
06 28 84	2049	2125	6.0000	7.0000
06 29 84	1848	1855	2.0000	1.0000
06 29 84	1855	1902	1.0000	4.0000
06 29 84	1902	1920	4.0000	7.0000
07 03 84	0119	0121	2.0000	7.0000
07 06 84	1805	1816	0.5000	0.1250
07 06 84	1816	1826	0.1250	0.5000
07 06 84	1826	1851	0.5000	4.0000
07 06 84	1851	1857	4.0000	7.0000
07 08 84	1905	1934	5.0000	7.0000
07 10 84	2101	2149	1.0000	1.0000
07 10 84	2149	2215	1.0000	6.0000
07 10 84	2215	2219	6.0000	7.0000
07 11 84	2249	2300	5.0000	7.0000
07 16 84	2303	2314	2.5000	7.0000
07 17 84	2330	2339	1.5000	6.0000
07 17 84	2339	2345	6.0000	7.0000
07 26 84	2019	2027	5.0000	7.0000
08 06 84	1603	1615	3.0000	7.0000
08 08 84	1958	2010	1.0000	1.5000
08 08 84	2010	2021	1.5000	3.0000
08 08 84	2021	2045	3.0000	7.0000
08 09 84	1914	1926	2.0000	4.0000
08 09 84	1926	1938	4.0000	7.0000
08 24 84	2152	2200	5.0000	7.0000
09 01 84	2148	2157	4.0000	7.0000
02 20 85	1645	1720	4.0000	7.0000
02 27 85	1818	1830	6.0000	7.0000
03 02 85	1731	1739	5.0000	7.0000
04 16 85	1550	1552	1.0000	6.0000
04 16 85	1552	1606	6.0000	7.0000
07 06 85	2051	2115	1.0000	2.5000
07 06 85	2115	2146	2.5000	5.0000
07 06 85	2146	2210	5.0000	7.0000



COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 08 85	0058	0110	0.7500	1.0000
07 08 85	0110	0149	1.0000	1.0000
07 08 85	0149	0219	1.0000	4.0000
07 08 85	0219	0247	4.0000	4.0000
07 08 85	0247	0346	4.0000	7.0000
07 08 85	0851	0953	5.0000	6.0000
07 08 85	0953	1007	6.0000	7.0000
07 08 85	1812	1823	1.5000	4.0000
07 08 85	1823	1840	4.0000	7.0000
07 15 85	0035	0050	2.0000	3.0000
07 15 85	0050	0055	3.0000	3.0000
07 15 85	0055	0107	3.0000	7.0000
07 15 85	2322	2345	2.5000	7.0000
07 18 85	0250	0258	2.0000	7.0000
08 01 85	0117	0127	2.5000	5.0000
08 01 85	0127	0137	5.0000	7.0000
08 19 85	2112	2129	2.5000	5.0000
08 19 85	2129	2150	5.0000	4.0000
08 19 85	2150	2200	4.0000	7.0000
08 24 85	1923	1945	2.0000	2.0000
08 24 85	1945	2006	2.0000	3.0000
08 24 85	2006	2045	3.0000	4.0000
08 24 85	2045	2135	4.0000	5.0000
08 24 85	2135	2145	5.0000	6.0000
08 24 85	2145	2152	6.0000	7.0000
08 25 85	1800	1804	0.7500	4.0000
08 25 85	1804	1813	4.0000	3.0000
08 25 85	1813	1833	3.0000	7.0000
08 25 85	1930	1947	5.0000	7.0000
08 30 85	2100	2112	1.5000	0.5000
08 30 85	2112	2128	0.5000	0.2500
08 30 85	2128	2146	0.2500	0.5000
08 30 85	2146	2155	0.5000	3.0000
08 30 85	2155	2209	3.0000	7.0000
09 26 85	2148	2155	0.2500	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
10 15 85	1744	1752	0.5000	0.5000
10 15 85	1752	1755	0.5000	4.0000
10 15 85	1755	1805	4.0000	7.0000
04 02 86	1245	1338	6.0000	7.0000
05 30 86	1945	2033	6.0000	7.0000
06 01 86	1645	1648	6.0000	7.0000
06 16 86	2149	2220	4.0000	7.0000
06 23 86	2314	2320	2.0000	2.5000
06 23 86	2320	2326	2.5000	6.0000
06 23 86	2326	2348	6.0000	6.0000
06 23 86	2348	2355	6.0000	7.0000
06 25 86	1830	1835	0.5000	1.0000
06 25 86	1835	1840	1.0000	3.0000
06 25 86	1840	1852	3.0000	6.0000
06 25 86	1852	1858	6.0000	7.0000
07 15 86	1906	1915	2.0000	4.0000
07 15 86	1915	1926	4.0000	7.0000
07 16 86	1452	1501	0.5000	1.0000
07 16 86	1501	1504	1.0000	6.0000
07 16 86	1504	1508	6.0000	7.0000
07 20 86	1845	1912	5.0000	7.0000
08 01 86	2130	2136	1.0000	4.0000
08 01 86	2136	2146	4.0000	6.0000
08 01 86	2146	2201	6.0000	7.0000
08 19 86	2138	2146	2.0000	4.0000
08 19 86	2146	2202	4.0000	7.0000
08 25 86	2004	2010	2.0000	2.0000
08 25 86	2010	2018	2.0000	6.0000
08 25 86	2018	2025	6.0000	7.0000
08 28 86	1853	1911	3.0000	7.0000
10 09 86	1642	1645	0.2500	3.0000
10 09 86	1645	1648	3.0000	7.0000
11 06 86	2212	2215	4.0000	7.0000
01 05 87	0520	0525	1.0000	7.0000
03 27 87	1547	1630	6.0000	7.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
04 03 87	1807	1818	2.0000	4.0000
04 03 87	1818	1847	4.0000	6.0000
04 03 87	1847	1910	6.0000	7.0000
05 06 87	1647	1651	1.0000	0.5000
05 06 87	1651	1657	0.5000	1.0000
05 06 87	1657	1714	1.0000	3.0000
05 06 87	1714	1740	3.0000	7.0000
05 10 87	1734	1741	0.5000	3.0000
05 10 87	1741	1747	3.0000	6.0000
05 10 87	1747	1805	6.0000	7.0000
05 14 87	2246	2300	4.0000	7.0000
05 15 87	1603	1607	0.1250	0.7500
05 15 87	1607	1615	0.7500	3.0000
05 15 87	1615	1628	3.0000	6.0000
05 15 87	1628	1640	6.0000	7.0000
06 04 87	0145	0247	5.0000	5.0000
06 04 87	0247	0311	5.0000	7.0000
06 14 87	1817	1824	3.0000	5.0000
06 14 87	1824	1830	5.0000	7.0000
07 14 87	1719	1724	2.0000	0.5000
07 14 87	1724	1732	0.5000	3.0000
07 14 87	1732	1747	3.0000	2.0000
07 14 87	1747	1753	2.0000	2.0000
07 14 87	1753	1801	2.0000	4.0000
07 14 87	1801	1811	4.0000	7.0000
07 25 87	1547	1554	2.5000	3.0000
07 25 87	1554	1601	3.0000	7.0000
07 26 87	1706	1711	2.0000	5.0000
07 26 87	1711	1716	5.0000	7.0000
07 31 87	1816	1824	2.0000	4.0000
07 31 87	1824	1837	4.0000	7.0000
08 02 87	2125	2134	2.0000	3.0000
08 02 87	2134	2146	3.0000	7.0000
08 02 87	2205	2210	0.5000	0.7500
08 02 87	2210	2215	0.7500	0.5000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
08 02 87	2215	2245	0.5000	0.7500
08 02 87	2245	2248	0.7500	7.0000
08 02 87	2319	2332	2.0000	7.0000
08 04 87	2055	2121	4.0000	7.0000
08 21 87	2345	2356	4.0000	7.0000
09 21 87	2010	2020	1.0000	1.0000
09 21 87	2020	2030	1.0000	5.0000
09 21 87	2030	2039	5.0000	7.0000
01 17 88	1547	1616	6.0000	4.0000
01 17 88	1616	1629	4.0000	0.5000
01 17 88	1629	1640	0.5000	7.0000
01 17 88	1650	1720	2.0000	7.0000
04 13 88	1325	1352	5.0000	5.0000
04 13 88	1352	1440	5.0000	7.0000
05 29 88	1255	1300	0.5000	7.0000
05 29 88	1547	1615	4.0000	1.0000
05 29 88	1615	1626	1.0000	2.0000
05 29 88	1626	1629	2.0000	3.0000
05 29 88	1629	1647	3.0000	4.0000
05 29 88	1647	1740	4.0000	7.0000
06 29 88	1951	2002	5.0000	7.0000
07 10 88	1715	1722	2.5000	1.0000
07 10 88	1722	1729	1.0000	5.0000
07 10 88	1729	1736	5.0000	5.0000
07 10 88	1736	1740	5.0000	7.0000
07 20 88	0130	0151	2.0000	2.0000
07 20 88	0151	0207	2.0000	4.0000
07 20 88	0207	0249	4.0000	7.0000
07 20 88	1652	1657	0.0000	0.2500
07 20 88	1657	1707	0.2500	1.0000
07 20 88	1707	1714	1.0000	1.0000
07 20 88	1714	1717	1.0000	7.0000
07 24 88	2154	2204	2.0000	0.5000
07 24 88	2204	2210	0.5000	1.0000
07 24 88	2210	2216	1.0000	0.5000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 24 88	2216	2226	0.5000	1.0000
07 24 88	2226	2240	1.0000	2.0000
07 24 88	2240	2251	2.0000	2.0000
07 24 88	2251	2256	2.0000	3.0000
07 24 88	2256	2303	3.0000	7.0000
07 25 88	2334	2347	3.0000	7.0000
07 29 88	1850	1922	3.0000	7.0000
08 04 88	0100	0112	2.0000	5.0000
08 04 88	0112	0147	5.0000	7.0000
08 14 88	1622	1632	1.0000	2.0000
08 14 88	1632	1651	2.0000	5.0000
08 14 88	1651	1714	5.0000	7.0000
08 14 88	1924	1949	2.0000	5.0000
08 14 88	1949	2001	5.0000	7.0000
08 19 88	1957	2011	2.0000	3.0000
08 19 88	2011	2050	3.0000	7.0000
08 23 88	1757	1809	2.0000	3.0000
08 23 88	1809	1818	3.0000	7.0000
08 27 88	1409	1414	1.0000	0.5000
08 27 88	1414	1419	0.5000	2.0000
08 27 88	1419	1428	2.0000	5.0000
08 27 88	1428	1435	5.0000	5.0000
08 27 88	1435	1438	5.0000	7.0000
03 03 89	1050	1150	6.0000	6.0000
03 03 89	1150	1250	6.0000	7.0000
03 03 89	1350	1420	6.0000	7.0000
03 25 89	2009	2014	0.2500	0.5000
03 25 89	2014	2022	0.5000	1.0000
03 25 89	2022	2031	1.0000	2.0000
03 25 89	2031	2044	2.0000	3.0000
03 25 89	2044	2049	3.0000	4.0000
03 25 89	2049	2105	4.0000	7.0000
06 28 89	2115	2130	2.0000	4.0000
06 28 89	2130	2140	4.0000	7.0000
07 09 89	2233	2250	4.0000	4.0000

COMPUTER DATA BASE OF VISIBILITY OBSERVATIONS  
AT PHOENIX SKY HARBOR AIRPORT (1949-1989)

Date	Time		Visibility (mi)	
	Start	End	Start	End
07 09 89	2250	2320	4.0000	7.0000
07 10 89	1610	1620	6.0000	7.0000
07 19 89	2050	2104	3.0000	7.0000
07 21 89	1950	2054	3.0000	5.0000
07 21 89	2054	2131	5.0000	7.0000
08 07 89	1843	1846	0.0000	0.2500
08 07 89	1846	1850	0.2500	0.2500
08 07 89	1850	1858	0.2500	0.5000
08 07 89	1858	1908	0.5000	1.0000
08 07 89	1908	1917	1.0000	2.0000
08 07 89	1917	1935	2.0000	5.0000
08 07 89	1935	1950	5.0000	5.0000
08 07 89	1950	2014	5.0000	7.0000
08 09 89	1808	1818	1.0000	2.5000
08 09 89	1818	1829	2.5000	5.0000
08 09 89	1829	1843	5.0000	7.0000
08 16 89	2150	2155	6.0000	7.0000
08 17 89	2122	2135	4.0000	4.0000
08 17 89	2135	2150	4.0000	7.0000

## **APPENDIX B**

### **Applied Environmental Consultants' Letter of Concurrence**

Mr. R.J. Gross  
Project Engineering Manager  
Bechtel Power Corporation  
302 North 1st Avenue, Suite 500  
Phoenix, Arizona 85003

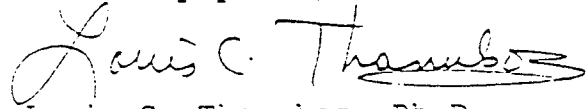
Subject: Palo Verde Nuclear Generating Station  
Bechtel Job 18601  
Master Agreement PV86-10638  
Dust Concentration Evaluation  
Job Order 310  
File: E.60.03.10  
Reference: Letter BE/APS-3734 dated April 11, 1990

Dear Mr. Gross:

We hereby concur with the information in the Dust Concentration Evaluation for Palo Verde Nuclear Generating Station Units 1, 2, and 3 (as included in Attachment 1 to the referenced letter). In addition, we hereby attest that the technical information associated with the visibility data, visibility to particulate concentration correlations, and calculated concentration and particulate loadings provided in the evaluation has been reviewed and is accurate to the best of our knowledge. Any calculated values have been appropriately verified and the verification methods will be maintained in our records for future reference.

Should any questions arise, please feel free to contact us.

Sincerely yours,

  
Louis C. Thanukos, Ph.D.  
Manager, Environmental Projects

LCT:eas